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UNIVERSITY OF ILLINOIS
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THE INTERNATIONAL CYCLOPÆDIA

A COMPENDIUM OF HUMAN KNOWLEDGE

REVISED WITH LARGE ADDITIONS

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IN FIFTEEN VOLUMES

Vol. XV

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UNLEAVENED BREAD, Use of, in the Eucharist, has long been a subject of controversy between the Latin church on the one hand and the Greek and other oriental churches on the other; with the latter of whom the reformed churches in later times have conformed in their practice of celebrating the Lord's supper. The early history of the usage is very obscure; but the western church had certainly, from a very remote date, employed *azyms*, or unleavened bread, in the consecration and distribution of the Eucharist; nor was this usage made a subject of controversy with the Latins by Photius, on occasion of the dispute between the churches, which arose during his patriarchate. In the later controversy, however, under Michael Cerularius (see Greek Church), the question of azyms became very prominent, and the diversity of practice still continues a subject of controversy between the Greeks and Latins. The principal argument alleged by the advocates of the use of leavened bread is founded on the assumption that the last supper of our Lord took place on the eve of the Passover, that is, on the 13th day of the month Nisan, on which day common bread and not the azyms, must have been used; and on this and some other grounds, some writers, even among the Roman Catholics themselves, and especially the learned Jesuit Sirmond, have maintained that the last supper was actually celebrated in leavened bread. On the other hand, however, it is contended that the last supper, being held in the evening of that day, was, in the strictest sense, our Lord's celebration of the Passover, and therefore (Exodus, xii. 8–20), that the bread can have been no other than azym, or unleavened. It must be added that all Roman Catholic writers, and the more learned among the Greeks, are agreed that the Eucharist may be *validly* consecrated whether the bread be leavened or unleavened.

UNLUCKY DAYS. See Day or Days.

UNST, the most northern of the Shetland islands, in lat. 60° 45′ n., is 12 m. long, and 5 m. in average breadth; area, 36 sq. m.; pop. '91, 2269.

UNTERWALDEN, one of the four Waldstätten, or forest cantons of Switzerland, comprising the two half cantons of Nidwald and Obwald (see Switzerland). It is 25 m. in length by 21 m. in breadth, and has an area of 295 sq. miles. In 1870 the pop. was 26,116; in 1894 it was 27,771. Unterwalden is bounded on the e., s., and w. by lofty hills, and subsidiary ridges divide it into two parallel valleys—both of which open on the n. into the lake of Lucerne. The eastern valley is drained by the Engelberger Aa, the western valley by the Sarner Aa. Great highways run up these valleys from the shores of the lake, and in several places communicate with each other; but they do not connect Unterwalden with surrounding cantons. The canton is chiefly pastoral. The capital of the Nidwald is Stanz (pop. '88, 2458), remarkable for its fine church and statue of Winkelried.

UPANISHAD is the name of those Sanskrit works belonging to the Vedic literature which contain the mystical doctrine of the Hindus on the nature of a supreme being, its relation to the human soul, and the process of creation (see India, sec. *Religion*). The word (derived from the Sanskrit prefixes *upa*, "beneath," or "near," and *ni*, "in," combined with the radical *sad*, "sit") is explained by the great theologian, *S'ankara* (q.v.), and others after him as meaning the "science of Brahman," or "the understanding of the identity of Brahman and the soul," because "in those devoted to it, this science *sets to rest* (or destroys) the world, together with (ignorance) its cause; or, in other words, because it shows to them that the world has, besides Brahman, no reality; Grammatical commentators explain its etymology as implying that "eternal bliss *reposes on it* (*upanishîdati s'reyo 'syâm*);" and Prof. M. Müller has surmised that the word "Upanishad meant originally the act of sitting down near a teacher, of submissively listening to him," whence it came to mean "implicit faith, and at last truth or divine revelation." But apart from the artificialness of all these interpretations, it deserves notice that the earliest sense of the word appears to be that of "secret" or "mystery" (literally, "that which *sits* or rests *beneath*"). Is this sense, it is mentioned by the grammarian Pân'ini; and as it is very probable that, in his time, the works bearing the name of Upanishads were not yet in existence (see Goldstücker's *Pân'ini*, etc., p. 141), it may be assumed that these works derived their name from the mysteriousness of the doctrine contained in them; and perhaps also from the mystical manner in which they propounded it.

In order to understand the origin and purport of the Upanishads, as well as the relation in which they stand to the Vedas, properly so called, it must be borne in mind that, though the Vedic hymns are based on the worship of the elementary powers, and the Brâhman'a portion connected with them is chiefly concerned in legendary and ritual matter relating to that worship, yet in both these portions of the Vedas, and especially in the Brâhman'as, the beginnings of a period become already visible when the poets raised the questions as to the origin of the world and the true nature of the gods. See INDIA, sec. *Religion*. A first attempt at a systematic answer to these questions was made in works which bear an intimate relation to the Brâhman'as; and so great was the awe in which, on this account, these works were held, that they had to be read in the solitude, where the mind could ponder in perfect calmness over the mysterious problems in which they are engaged. These are the *Aran'yakas* (from *aran'ya*, a forest.) But as the style and contents of the Aran'yakas are extremely obscure, and as, through the close alliance of these works to the Brâhman'as, of which some of them form part, the theological questions of which they treat are much overlaid with ritual and other matters which properly belong to the Brâhman'as, a further progress made in the same direction, led to the composition of works and treatises, the diction of which is somewhat clearer and less entangled with subjects extraneous to the problems they intend to solve. Such works and treatises are the *Upanishads*. Their object, like that of the Aran'yakas, is to impress the mind with the belief in one supreme spirit (*Brahman*, as a neuter, and different, therefore, from the same word as a masculine, which is the name of the first god of the *Trimûrti*, q.v.), to show that this supreme spirit is the creator of the world; that the world has no reality if thought of besides Brahman, and that the human soul is identical in nature with that same spirit whence it emanates. The reward the Upanishads hold out to the believer, who understands their doctrine, and firmly adheres to it, is freedom from transmigration (q.v.), and consequent eternal bliss. The object and aim of the Upanishads are therefore the same as those propounded in the philosophical systems (see SANSKRIT, sec. *Literature*); and the Upanishads may therefore be looked upon as the forerunners of these systems themselves—those Upanishads, at least, which we may call the older Upanishads; for as to the more recent ones, and those which bear the stamp of a sectarian character, their claim to be ranked among the Vedic writings is extremely doubtful, if at all admissible.

Though agreeing in the main points of their doctrine, it is easily understood that works of this nature, ranging over different periods of Hindu religion, will also differ from one another both in the manner and detail in which they deliver their subject-matter, and in the degree of completeness with which they treat of it. Thus, in some, the legendary narrative, and even ritual detail, are still considerably blended with the theosophical speculation—and these stand nearest, therefore, the Aran'yakas, probably also in time; in others, more philosophical, the nature of Brahman and the human soul is the only subject of inquiry, in others, the process of creation is also enlarged upon, with detail which harmonizes more or less either with the ulterior views of the Vedânta (q.v.) or those of the Sa'nkhya (q.v.) philosophy; some Upanishads, again, especially emphasize the inefficiency, for the attainment of eternal bliss, of the performing religious acts and of worldly studies—the knowledge of Brahman being the only means that leads to this end; others, on the contrary, in conformity with the Yoga (q.v.) doctrine, assign a prominent place to the exterior means, by using which the soul would qualify itself for union with the supreme spirit; while the sectarian Upanishads, which identify this spirit with Vishn'u and S'iva, have, besides, the tendency of reconciling the popular with the philosophical creed.

Of the older Upanishads, a typical instance is furnished in the Chhândogya Upanishad of the Sâmaveda, the framework of which is legendary throughout, and its contents allegorical and mystical. Other shorter Upanishads, freer from narratives and allusions to the mysterious import of ritual acts, aim at a more intelligible exposition of the doctrine of the soul. Of their mode of treatment, the following passage from the *Kât'haka* Upanishads will serve as an example; *Nachiketas*, the son of Vâjas'ravas, having come to the abode of Yama, the judge of the dead, and obtained from him the grant of three boons, asks of him, for his third boon, an answer to the following question; "There is this doubt: some say that (the soul) exists after the death of a man (in connection with another body than this); others say that it does not. This I should like to know, instructed by thee." And Yama, after some hesitation, explains to him that the soul and Brahman are one, but that a man attains immortality only by understanding this unity, and that, to arrive at this understanding, he must free his mind from sensual desires, and get a correct knowledge both of the nature of Brahman and of the soul. "Know the soul as the rider, and the body as the car; know intellect as the charioteer, and *manas* (the organ of volition) as the rein. The senses, they say, are the horses, the objects (their) roads; and the enjoyer (i.e., the rider) is (the soul) endowed with body, senses, and manas. Thus say the wise. If he (the charioteer) is unwise, and his manas is always unbridled, his senses are uncontrolled like vicious horses; but if he is wise, and his manas is always bridled, his senses are controlled like good horses. He who, always impure, is unwise, and whose manas is unbridled, does not attain *that* abode (of immortality), but comes to the world (of birth and death), he, however, who, always pure, is wise, and whose manas is bridled, he attains *that* abode whence he is not born

again. The man who has a wise charioteer, and whose manas is bridled, reaches the other shore of the road (of the world), the highest abode of Vishn'u. Higher (i.e., subtler), indeed, than the objects are the senses; higher than the senses is manas; higher than manas, intellect; and higher than intellect, the great one, the soul. Higher than the great one is that which is unmanifested, and higher than the unmanifested is Purusha, the supreme spirit. But higher than Purusha there is nothing; he is the goal, the highest resort. This highest spirit is the soul hidden in all created beings; it is not manifest, but is beheld by those who can see what is subtle with an attentive, subtle intellect." The coincidence between the allegory, in the foregoing passage, and that in Plato's *Phædrus*, imparts an additional interest to this Upanishad, which is valuable, moreover, on account of the evidence it affords as to points of agreement and difference between its views of the development of the world and those expounded in the Sânkhya (q.v.). The *Mun'daka* Upanishad is important for the relative position which it assigns to the teaching of the Vedas, and the doctrine of the Upanishads. "Two sciences," it says, the knowers of Brahman tell us, "must be known, the higher and the inferior. The inferior is (the knowledge of) the R'igveda, the Yajurveda, the Sâmaveda, and the Atharvaveda, the knowledge of pronunciation, the ritual, grammar, explanation of Vedic texts, prosody, and astronomy. But the higher knowledge is that by which that imperishable Brahman is comprehended. That which is invisible, unseizable, without descent (or origin), without either color, eye, or ear, without hand or foot, eternal, manifold (in creation), all-pervading, very subtle, undecaying—the wise behold it as the cause of created beings." And in another place the performers of the sacrificial rites ordained by the Veda are said to attain, indeed to Indra's heaven in virtue of their pious work; but this state of bliss is declared to be unstable and perishable, and these "fools . . . . drop (from their heaven) as soon as this heaven (the reward of their acts) has faded away. Fancying that pious acts, ordained by the Vedas and codes of law, are the highest (object of man), these ignorant people do not know that there is something else which leads to eternal bliss. Having enjoyed (the reward of their deeds) on the happy summit of paradise, they enter again this world, or one that is (even) lower. Those, on the contrary, who practice penance and faith, and, with subdued desire, live in the forest, under the vow of a religious mendicant, they, free from sin, enter through the sun to that abode where resides that immortal spirit, that spirit, indeed, of undecaying nature."

The *Talavakâra*, or *Kena*, Upanishad, which, being one of the shortest, is in form one of the most philosophical treatises of this kind, puts in clearer language, perhaps, than any other Upanishad, the doctrine that the true knowledge of the supreme spirit consists in the consciousness which man acquires of his *incapacity* to understand it, since the human mind being capable only to comprehend finite objects, cannot have a knowledge of what is infinite.

The Upanishads are not supposed to have been revealed in the same manner as the Vedic hymns. See VEDA. Nevertheless, with the exception of a few confessedly modern Upanishads, they are not assigned to human authorship, but looked upon as inspired writings, to which the term *S'ruti* (q.v.) applies. In several Upanishads, no special mention is made of their divine origin; in some, however, this is done. Thus *Chhándogya* Upanishad, in its concluding section, relates: "This (knowledge of the soul) Brahman (the god of the Trimûrti) imparted to Prajâpati (a lord of creation—the patriarch Kas'yapa, as S'ankara explains); Prajâpati imparted it to Manu, and Manu to mankind; the *Br'ihadâranyaka* Upanishad which on three occasions gives long lists of teachers who handed it down to their pupils, always ascribes itself, in the last instance, to the authorship of "the self-existent Brahman (the supreme spirit); and in a similar manner the *Mun'd'aka* Upanishad says that it was Brahman (the god of the Trimûrti), the creator of the universe, who first taught the science of the supreme spirit to his eldest son, Atharvan. As in the case of most ancient works of Sanskrit literature, the date of the Upanishads also still remains quite uncertain, and, wherever given, is purely conjectural. According to the native system, they are classified as belonging to one or the other of the four Vedas, with which they are held to stand in immediate connection. There are Upanishads, consequently, of the R'ig-, Yajur-, Sâma-, and Atharvaveda. But this classification has no reference whatever to chronology. For a fuller account of these works, see Prof. Weber's *Indische Studien*, vols. i. ii. (Berlin, 1850–53), and his *Akademische Vorlesungen über Indische Literatur-geschichte* (Berlin, 1852); Prof. M. Müller's *History of Ancient Sanskrit Literature* (Lond. 1860); John Muir's *Original Sanskrit Texts*, vol. i.–iv. (Lond. 1858–63); and the edition and translation of several of these Upanishads by E. Roer, *Râjendra Lâla Mitra*, and E. B. Cowell, in the *Bibliotheca Indica*; also Raja Rammohun Roy's *Translation of several Principal Books, Passages, and Texts of the Veds* (Lond. 1832). The names of 149 Upanishads, as compiled from various sources by Prof. M. Müller, may be found in the *Zeitschrift der Deutschen Morgenländischen Gesellschaft*, vol. xix. p. 137, ff.

UPAPURAN'A. See PURÂN'A.

U'PAS (the Malay word for *poison*) is the name given to a number of vegetable poisons in the Eastern archipelago and the Philippine islands. The most celebrated poison of this kind is produced by the *antjar* (*antiaris toxicaria*), a tree which grows in the Sunda and Philippine islands. It attains a height of upward of 100 ft., and belongs

to the natural order ARTOCARPACEÆ (q.v.), the same order with the bread-fruit. The leaves are lanceolate. The female flowers are solitary; the male flowers congregated beneath them in numbers upon the receptacle, which has a long stalk, and is of the shape of a watch-glass. The fruit is a kind of drupe, covered with fleshy scales. From the milky juice of this tree (called in some of the islands *pohon-upas antjar* in Java and *ipo* in the Philippines), mixed with black pepper, and the juice of galanga root and of ginger, the Malays prepare a poison for their arrows, which proves speedily fatal to men and to the larger mammalia. The only hope of relief is by means of severe vomitings and the excitement of profuse perspiration. Although the fresh juice of this tree, brought into contact with the skin, acts as a poison, the story of a poison-vale in Java, in which the exhalations of numerous poison trees extinguish all animal life, and even all other vegetable life, is a mere fable. There is a narrow valley in Java where neither animal nor vegetable life can subsist, but this is owing to carbonic acid gas emitted from the ground, as in the *Grotto del Cane*, near Naples, and the upas-tree is as incapable of living there as any other. It is found in forests, and does no harm to the other trees around it. The prepared upas or antjar poison is kept in close tubes of bamboo, and is of the consistence of molasses. The flesh of animals killed by this poison may be eaten with perfect safety; although the virulence of the poison is shown by its extremely rapid action. It is not perfectly known what the substance is which gives to the juice of the upas tree its poisonous properties, but it appears to be an alkaloid. The fiber of the bark of the upas tree is sometimes made into cloth, but unless the fiber is thoroughly cleaned, garments made of it produce a painful itching. A still more powerful poison than the upas antjar, employed in the same part of the world, is the *upas tjettek* or *upas tieute*, which is prepared in a similar manner from the root of the *strychnos tieute* (see STRYCHNOS). It abounds in strychnine.

UPHAM, CHARLES WENTWORTH, 1802–75; b. St. John, N. B.; graduated at Harvard college, 1821, and at the divinity school, 1824; ordained colleague pastor with rev. John Prince of the First Unitarian church, Salem, Mass.; relinquished the ministry on account of loss of voice in 1844. He edited the *Christian Review* and *Christian Register;* was mayor of Salem, 1852; several times member of the legislature; president of state senate, 1857–58; member of congress, 1853–55. He published *Letters on the Logos; Lectures on Witchcraft; Life of Sir H. Vane; Life of J. C. Fremont; Prophecy as an Evidence of Christianity.*

UPHAM, THOMAS COGSWELL, D.D., 1799–1872; b. N. H.; graduated Dartmouth college, 1818; Andover theological seminary, 1821; assistant teacher of Hebrew; colleague pastor of the Congregational church, Rochester, N. H., 1823–24; professor of mental and moral philosophy, and instructor in Hebrew, Bowdoin college, 1825–67. He published, *Elements of Mental Philosophy; Treatise on the Will; Principles of Interior or Hidden Life; Ratio Disciplinæ; Treatise on Divine Union; The Life of Faith.* His writings are deeply spiritual, and though their philosophy tends to mysticism, are quickening and suggestive.

UPHEAVAL or **UPTHROW OF STRATA,** the change in stratified rocks from their original horizontal position to one more or less inclined, produced by an expansive subterranean force, or other power, like the pushing forward of the crust itself, as in the case of the Appalachian mountains (q.v.). In slight changes of level, the continuity of the rock is unbroken; but frequently immense cracks are formed, into which igneous rocks penetrate, and form a backbone for the upraised mass, or dikes penetrating the strata.

UPHOLSTERY, that branch of trade which relates to the furnishing of a house with curtains and other kinds of hangings. It is also applied more generally, and is made to include bedding, carpeting, and the covering of chairs, couches, etc.

UPJOHN, RICHARD, 1802–78; b. England. He emigrated to the U. S., 1829, and soon became known as an architect; settled in New York, 1835, where his best work was done. He designed the cathedral at Bangor, Me., Christ church and the church of the Pilgrims in Brooklyn; and in New York, Trinity church, the Trinity building, Grace church, and St. Thomas' church, besides planning numerous private residences. For a time he was pres. of the American institute of architects.

UPOLU', one of the richest and most beautiful of the islands of the Pacific, belongs to the Samoan group, lying about 60 m. w. of Tutuila. It is 140 m. in circumference, and has 16,000 inhabitants. The island has been a mission station for many years, and the English consul was till 1875 the son of Mr. John Williams, the missionary, whose melancholy fate is well known. Many of the inhabitants are Christians. The chief harbor is Apia, a civilized-looking place, with many edifices on the European model.

UPPER DARBY, a township in Delaware co., Pa.; traversed by the Philadelphia, Wilmington, and Baltimore railroad; contains the villages of Fernwood and Landsdowne. Pop. '90, 4773.

UPPER SANDUSKY, village and co. seat of Wyandot co., O.; on the Sandusky river and the Columbus, Hocking Valley, and Toledo and the Pennsylvania Co.'s railroads; 60 miles s. of Toledo. It occupies part of the site of the home of the Wyandot Indians, and has an old Indian mission cemetery, electric lights, national and state banks, nearly a dozen churches, and foundries, machine shops, carriage factories, brewery, and casket, gas engine, plow point, and feed mill works. Pop. '90, 3572.

UPSALA or UPSAL, a district or län in Svealand, Sweden, situated on the gulf of Bothnia, 2051 sq. m.; pop. '95, 123,015. The surface is rugged and barren in the n. but has a fertile soil elsewhere; cattle are largely exported. Iron ore is found in large quantities. The best mines are those of Dannemora. Capital, Upsala.

UPSA'LA, an ancient and beautiful t. of Sweden, on the Fyrisa, a navigable stream 45 m. n.w. of Stockholm. The eastern part of the town stands on a wide and fertile plain; the w. part, containing the chief buildings, occupies a high range of ground looking over an apparently boundless plain to the n. and east. Upsala is the seat of an archbishop, who is the primate of the whole country. The great attraction is the cathedral, once a beautiful structure, and handsome still, though disfigured by restorations. It is in the Gothic style, built of brick, was founded in 1258, and completed 1435; is 370 ft. long by 128 broad, and 92 ft. high, and contains the tombs of Linnæus, and of Gustavus Vasa and several other Swedish kings. The university of Upsala—the chief institution of the kind in the country—founded in 1477, is attended by about 1700 students, taught by 122 professors and other teachers. The library contains 275,000 vols. and 12,000 MSS., several of which are very valuable. Pop. '95, 21,428, the mass of whom are dependent upon the university for their livelihood.—Two miles n. of the town is Old Upsala, now a village, which during the heathen period was the seat of the Odin worship, with a splendid temple and sacred grove, which have now disappeared. Also about 4 m. from Upsala are the famous Mora-stones, where in the middle ages the election and crowning of the Swedish kings took place.

UP-SAR-O-CA, or ABSAROKA. See CROWS.

UPSHUR, a co. in n.e. Texas; 520 sq. m.; pop. '90, 12,695, chiefly of American birth, includ. colored. Co. seat, Gilmer.

UPSHUR, a co. in central West Virginia, containing the head-waters of the Monongahela river; 350 sq. m.; pop. '90, 12,714, chiefly of American birth, with colored. Co. seat, Buckhannon.

UPSON, a co. in central Georgia, having the Flint river for its s. boundary; 321 sq. m.; pop. '90, 12,188, chiefly of American birth, includ. colored. Co. seat, Thomaston.

UPTON, a co. in w. Texas; created in 1887; unorganized, and attached to Midland co. for judicial purposes; 1140 sq. m.; pop. '90, 52.

UPTON, EMORY, b. N. Y., 1839; graduated at West Point, 1861. In the war of the secession he served as aid to Gen. Tyler, was wounded at Bull Run, and took part in the battles of South Mountain, Antietam, Fredericksburg, Chancellorsville, and Gettysburg. At Spottsylvania he was again wounded, but was present at the battle of Cold Harbor, the siege of Petersburg, the Shenandoah campaign, and elsewhere. He was promoted through the various grades, and at the end of the war had the brevet rank of maj.-gen. His treatise on *Infantry Tactics* was adopted in 1867. He d. 1881.

UR, a city in n. Mesopotamia, mentioned in the Bible, as the place from which Tarah, the father of Abraham, emigrated to Canaan. Its ruins, discovered by Rawlinson on the site of Mugheir, on the right banks of the Euphrates, contain the remnants of a large temple built in honor of the moon-god Sin, the tutelary deity of Ur.

U'RACHUS, THE, in the adult human subject, is a small fibrous cord formed by the obliteration of a tubular canal, which in the embryo runs from the apex of the bladder to the umbilical cord. In other mammals it remains open, and is continuous with one of the fetal membranes; and it has been found pervious in the human subject at birth.

U'RAL, a river of Russia, called *Rimna* by the ancients, later, *Jaik*, and since 1775 by its present name, rises in the southern section of the Ural mountains, near the e. frontier of the government of Orenburg. It flows s. through the district of Troitzk, past the town of Virchni-Uralsk, to its confluence with the Kisil; and in this region its course is over hilly meadows, and its current is very rapid, owing to its narrow and uneven bed. At the town of Orsk the river bends westward, and runs in that direction as far as the mouth of the river Tchagan, after which it flows directly s., and falls into the Caspian sea. It is deep enough for navigation; but owing to the scarcity of wood for ship-building, and the number of sandbanks that bar the river, no navigation can be carried on. This loss, however, is compensated by the fisheries of the river, which abounds in the most highly esteemed varieties of fish. The Ural has long served as the frontier separating Russia from the Kirghis steppes, and many forts have been erected, and a settlement of Cossacks — known as the Ural Cossacks — established along the river. The direct length of the Ural is estimated at 550 m.—with windings, 1040 miles. The principal affluents are the Kisil and Sakmara, on the right, and the Ore and Ilek on the left.

URAL MOUNTAINS (probably the Tartar word *ural*, belt), the *Hyperborean mountains*, or *Rhipæi montes*, of the ancients, form part of the boundary between Europe and Asia, and separate European Russia on the w. from Siberia on the east. The chain extends s. from the Kara sea, an arm of the Arctic ocean, to the middle course of the

Ural river, or from lat. 70° to that of 50° n., and is 1333 m. in length, with a breadth varying from 16 to 66 miles. Although the Ural mountains form really a single uninterrupted chain, geographers have agreed to consider them as divided into three sections—the northern, middle, and southern Ural. The northern Ural separates the basins of the rivers Petchora and Ob, is for the most part rocky, does not rise higher than 3,000 ft., and is commonly called *Poustoi* (empty), because it is extremely poor in ore. The middle Ural, commonly called *Roudnoi* (metalliferous), the principal seat of the mineral riches of the whole chain, comprises the highest peaks, as the Kanjakovski Kamen, rising to 5,000 ft.; but in some places the height is so insignificant, and the slope so gentle, that travelers can scarcely distinguish it from the lowlands. The southern Ural divides itself into three branches, two of which extend to the e. of the Ural river, and gradually disappear in the Uralo-Caspian deserts, while the third branch extends along the right—the western—bank of the Ural. The chain is composed chiefly of crystalline and metamorphic rocks, granite, gneiss, porphyry, chloritic, and micaceous schists. The Ural mountains, especially the middle and the n. part of the southern Ural (the governments of Perm and Orenburg), abound in mines of gold, platinum, copper, and iron. These mines, or *zavods*, are partly the property of the state, partly that of private individuals. Of the latter, the chief are the Nijni-Tagilsk, belonging to the Demidoff family; the Verchisetsk and Neviansk, belonging to the Takosleff family. The gold diggings occur on both slopes of the mountains, and gold is sometimes found in nuggets of considerable weight—the heaviest ever found in the chain being about 80 English lbs. in weight. In 1893, 26,352 lbs. of gold were extracted from the Ural mountains. The platinum found is chiefly obtained from the Nijni-Tagilsk mines. The richest copper ores in the Ural mountains are malachite and azurite; but the metal is extracted also from pyrites. Coal to the extent of 242,000 tons was extracted in 1894. The total amount of copper found in 1893 was 2789 tons. The amount of pig-iron extracted in 1895 was 542,000 tons. Among precious stones the most notable are the emerald, found on the eastern slope in the district of Ekaterinburg. Other precious stones are found, as the beryl, topaz, amethyst, and diamond, the last discovered in accordance with the prediction of Humboldt, but of small value. Malachite and jasper also occur. Rock-salt is abundant.

URALSK, a Russian t., capital of the province of the same name, stands on the right bank of the Ural, 150 m. s.s.e. of Samara. It was founded in 1622 by the Ural Cossacks, and was till 1775 known under the name of Jaitsk. A good trade is carried on—the principal articles being fish, isinglass, caviare, tallow, cattle, hides, and a variety of imported goods. Pop. '91, 27,036.

URANIA (i.e., "the heavenly muse") was a daughter of Zeus and Mnemosyne. She was regarded as the muse of astronomy, and was represented with a celestial globe, to which she points with a little staff.

URANIUM (sym. U, atomic weight–new system, 240–sp. gr. 18.33) is a very hard but moderately malleable metal, resembling nickel or iron in its luster and color; but in a finely comminuted state, occurring as a black powder. It is not oxidized by exposure to air or water at ordinary temperatures; but if heated in the air, it burns brilliantly, and is converted into oxide. It is a comparatively rare metal, which never occurs native; its sources being *pitch-blende*, which contains nearly 80 per cent of black oxide; *uranite*, which contains a hydrated double phosphate of lime and uranium; and *chalcolite*, which is a similar phosphate of copper and uranium. Uranium forms two principal oxides, a *dioxide*, UO_2, and a *trioxide*, UO_3. These can combine to form others. The dioxide is basic, while the trioxide is an acid-forming oxide. For the methods of preparing these oxides, the reader may consult any of the larger chemical text-books. The black oxide, U_2O_5, is of much value as a pigment for coloring porcelain; and compounds of the trioxide (or peroxide) with the earths are employed to communicate a peculiar yellow tint to glass. The salts of the dioxide have a green, and those of the trioxide a yellow color. None of them are of any special importance. The metal is extracted from pitch-blende; and its isolation in a pure form is due to Peligot in 1841; Klaproth's supposed metal (which he discovered in 1789) turning out to be the protoxide. The metal was not obtained in the compact form till 1856.

U'RANOS, or Cœlus, in mythology (a Greek word signifying heaven), son and husband of *Gæa* or *Terra*, the earth, and father of the Titans, Cyclopes, Hecatoncheirians, etc. He confined his children from their earliest infancy in Tartarus, but was overthrown and dethroned by Cronos, the youngest, at the instigation of Gæa. Out of the drops of his blood sprang the Gigantes, and Aphrodite rose out of the foam of the sea which gathered around him. He was succeeded on the throne of heaven by Saturn and Jupiter.

URANUS. See Planets.

URBAN, the name of eight popes, of whom the following deserve to be specially noticed.—Urban II., a Frenchman by birth, and originally a monk of Clugny, was elected in a council held at Terracina, in the year 1088, during the schismatical pontificate of the anti-pope Guibert, styled Clement III. Urban's name was Otho, and he had been bishop of Ostia. Soon after his election he resumed possession of Rome, the for-

tresses of which had been occupied by the anti-pope, whom he compelled to withdraw. Guibert, nevertheless, was still supported by his patron, Henry IV. of Germany, who had long been at feud with the papal see; and Urban, in concert with the celebrated countess Matilda, having formed a strong party in Italy, Henry once more led an army thither, and excited in Rome against the pope a party, whom he induced to recall Guibert—Urban establishing himself at Anagni. The revolt of Conrad, the eldest son of Henry, against his father, and his coronation as emperor at Milan in 1093, and still more the successful appeal of Henry's queen, Adelaide, turned the tide of affairs in Italy. A great council was held at Piacenza in 1095, in which the anti-pope and his adherents were excommunicated. In the same council the crusade was proclaimed; and in the following autumn, Urban, in a council held at Clermont, made the well-known appeal on the same subject, which called forth that enthusiasm which was destined to lead to the long series of efforts for the recovery of the Holy Land, which forms so striking a characteristic of mediæval history. In his later pontificate Urban pursued the same course, and, in the end, succeeded in driving Henry IV. out of Italy. The most important event of the last years of his pontificate was the holding of a council at Bari in 1098, in which many Greek bishops were present, and in which the addition of the words *filio que* to the creed was discussed. Thence he returned to Rome, of which he obtained full and undisturbed possession; and he died in the close of 1099, just at the time when the first crusade which he had organized terminated in the successful occupation of Jerusalem.—URBAN V. (originally William de Grimoard) is remarkable as practically the last of the popes who resided at Avignon, and the one by whom the papal seat was for a time re-transferred to Rome. He was a native of France, and had been abbot of St. Victor at Marseilles. On the death of Innocent VI. in 1362, he was elected at Avignon, where he continued to reside, sending his legate, cardinal Gil de Albornoz, to reduce the rebellious subjects of the papal see in Rome. After various alternations of peace and contest, Urban took the resolve of returning in person to the ancient seat of the papacy. He set out in 1367; and, landing at Corneto, proceeded first to Viterbo, and in the end to Rome, which he reached in Oct., 1367. He found the papal city in a condition all but ruinous, and the whole of Italy overrun by bands of mercenaries, and a prey to intestine divisions of the worst character. He endeavored, in concert with the queen of Naples, Joanna, in the following year, and of the emperor Charles IV., to repress these disorders, but with little success; and in 1370 he resolved once again to repeat the experiment of a withdrawal of the papal residence from Rome. He set out in September of that year; but only outlived his return to Avignon by a few weeks, and died in Dec., 1370, leaving the reputation of great personal piety, disinterestedness, and zeal for the interests of religion and morality.—URBAN VI. deserves a special notice as being the pope under whom the great western schism had its origin. His name was Bartolomeo Prignano, and at the time of his election he was archbishop of Bari. On the death of Gregory XI. (1378), who had finally returned from Avignon to Rome, and died in that city, Prignano was elected in a conclave held at Rome under circumstances of great excitement, owing to the apprehension, on the part of the populace, of an intention to elect a French pope, and again abandon Rome. The cardinals in the conclave numbered 16, of whom 12 were French, and 4 Italians. Prignano, although not a cardinal, was elected, April 8, 1378; and after the election had been made, the populace having broken into the hall, the cardinals dispersed; on the following day, however, they returned, confirmed the election, Prignano assuming the title of Urban VI., under which name he was crowned, April 18, in the presence of the 16 cardinals. In July of the same year the 12 French cardinals assembled at Anagni, and evoked the election of Urban, in which they declared that they had been acting under the fear of violence. To this course they are said to have been led by the rigor and the intemperate severity with which Urban was proceeding in the reforms of discipline, and especially of the simony and the irregular life of the clergy, including the cardinals themselves. They were joined by three of the Italian cardinals (one of them having died). On Sept. 20 they proceeded to elect the cardinal bishop of Cambray (born count of Geneva) pope, under the name of Clement VII. Clement took up his residence at Avignon. Urban, remained at Rome, where he appointed 26 new cardinals, and excommunicated Clement and his adherents. This conflict of claims was the origin of the Western Schism (see SCHISM, WESTERN). Urban was recognized as the lawful pope by one portion of the west, Clement by the other, and each maintained his claim by measures of the most extreme character. Urban especially, although his title seems to have been best founded, weakened his cause by his excessive violence. Having engaged in a dispute with Charles, king of Naples, whom he had himself crowned, he was besieged by that prince at Novara, whence he withdrew to Genoa, taking with him, as prisoners, the cardinals of his party with whom he had quarreled, and several of whom he is said to have put to death. In 1389, while he was on his way to Ferentino, he fell from his horse, and, having been conveyed to Rome, died from the injuries thus sustained in October of that year.—URBAN VIII. was the successor of Gregory XV. His family name was Maffeo Barberini. He was born at Florence in 1568; and after a long series of brilliant services both in the domestic administration and in foreign nunciatures, he was elected pope in Sept., 1623. In the difficult position of Roman affairs, as complicated between France, Austria, and Spain, in the war of the Valtellina, to which he succeeded on his

first election, he acquitted himself with much dexterity. His pontificate was also signalized by the acquisition to the holy see of the duchy of Urbino (q.v.) in 1626. Urban died in 1644. His memory has suffered through the imputation of nepotism; but his administration was, on the whole, vigorous and enlightened. He was the founder of the celebrated college of the Propaganda, and to him Rome is indebted for many public works, including large and important additions to the Vatican library. Some of the early stages of the Jansenist controversy (see JANSEN) fall within this pontificate.

URBANA, city and co. seat of Champaign co., Ill.; on the Cleveland, Cincinnati, Chicago, and St. Louis, the Illinois Central, and the Wabash railroads; 50 miles e.s.e. of Bloomington. It is the seat of the university of Illinois: contains five large modern public school buildings, Crystal Lake park, Deaconess home for orphans, co. poorhouse, public library, and the main shops of the C. C. C. and St. L. railroad; and has electric lights and street railroads, good sewerage and water supply, national and private banks, foundry and machine shop, planing mills, tile factories, and weekly newspaper. Pop. '90, 3511.

URBANA, city and co. seat of Champaign co., O.; on the Cleveland, Cincinnati, Chicago, and St. Louis, the Erie, and the Pittsburg, Cincinnati, Chicago, and St. Louis railroads; 40 miles w. by n. of Columbus. It is the seat of Urbana university (Swedenborgian), and has a high school, convent, public library, children's home, Soldiers' monument, electric lights, waterworks on the Holly system, national banks, about a dozen churches, railroad car works, straw-board works, woolen mills, broom factories, tannery, egg case factory, and daily and weekly newspapers. Pop. '90, 6510.

UR'BI ET OR'BI (Lat. to the city and the world), a form used in the publication of papal bulls, for the purpose of signifying their formal promulgation to the entire Catholic world, as well as to the city of Rome. By the canon law one of the conditions required in order that any new law shall be held to have force is "promulgation;" but a very celebrated controvery arose in the 17th c. as to the kind of promulgation which should be regarded as sufficient. In ancient times the practice of the popes had been to send copies of their bulls to the primates, metropolitans, and other ecclesiastical heads of the several churches, to be by them communicated to their suffragan bishops; but in progress of time the practice of publicly proclaiming or of posting up the decree in the Campo dei Fiori in Rome was substituted for this transmission; and decrees addressed URBI ET ORBI, and published in this way, were held to be thus sufficiently promulgated to the various churches, and to be thenceforth of full force. The French jurists of the 17th c. strenuously controverted this view.

UR'BINO, an old town in central Italy, province of Urbino e Pesaro, situated 25 m. s.w. of Pesaro, and between the rivers Metauro and Foglia. Its walls date from the 14th c.; it has a magnificent palace, once the residence of the dukes of Urbino, where was the famous library of the Della Rovere family, afterward removed to the Vatican. Another handsome palace is that of the Albini, belonging to an Albanian family escaped from the ferocity of the Turks and subsequently settled in Urbino, where they became rich and powerful and gave a pope to the church, who took the name of Clement XI. A university founded in 1564 is still in existence. Its manufactures and agriculture are flourishing. It is the birthplace of Raphael. Pop. '81, commune, 16,812. Urbino was a *municipium* under the Romans, and during the middle ages became the seat of a race of independent dukes, who existed up to 1626, when on the death of Francesco, the last duke, Urban VIII., took possession of the duchy as a vacant fief; and it continued to form part of the papal states till 1860, when it became part of the kingdom of Italy.

URCHIN, SEA. See ECHINIDÆ.

URE, ANDREW, M.D., a distinguished chemist, was born at Glasgow in 1778, educated at Glasgow university, subsequently prosecuted his medical studies at Edinburgh and returned to Glasgow, receiving the degree of M.D. in 1801. In 1802 he became professor of chemistry and natural philosophy in the Andersonian institution (see ANDERSON, JOHN), took an active part in the establishment (1809) of an observatory at Glasgow, and was appointed its first astronomer. In 1813 he made his appearance in the literary world as the author of a *Systematic Table of the Materia Medica*, which was followed in 1818 by *New Experimental Researches on Some of the Leading Doctrines of Caloric*, a memoir which, read before the royal society and printed in the *Philosophical Transactions*, brought Ure prominently into notice as a natural philosopher. Several papers on chemical subjects, the fruits of his accurate and extensive researches, followed. In 1821 appeared his *Dictionary of Chemistry;* in 1822 a paper *On the Ultimate Analysis of Animal and Vegetable Substances*, one of the earliest contributions to organic analysis, and a translation of Berthollet on *Dyeing;* and in 1829 a *System of Geology*, in which the hypothesis of a general flood was maintained. In 1830 Ure removed to London, and in 1834 was appointed analytical chemist to the board of customs. The products of his pen from this time assume more of a technological character, as the *Philosophy of Manufactures* (1835), *The Cotton Manufacture of Great Britain Compared with that of other Countries* (1836), and *Dictionary of Arts, Manufactures, and Mines* (1839). He died in 1857.

URE'A, $CO(NH_2)_2$, is an organic matter which derives its name from its having been originally discovered in the urine, of which it forms the most important and characteristic ingredient. It was until recently regarded as an organic base or alkaloid; but during the last few years it has been placed amongst the *amides*, a group of neutral, and for the most part crystallizable compounds, of the *ammonia type* (see TYPES, CHEMICAL), in which one of the three equivalents of hydrogen is replaced by the radical of an organic acid. For example, if R represent the radical, $\left.\begin{matrix}R\\H\\H\end{matrix}\right\}N$ represents the corresponding amide; and the character of the type is not affected by doubling the entire number of molecules, or changing it into $\left.\begin{matrix}R_2\\H_2\\H_2\end{matrix}\right\}N_2$. Now, if in this formula we substitute CO (carbonic oxide or carbonyl, as it is now often termed) for R_2, we obtain $\left.\begin{matrix}CO\\H_2\\H_2\end{matrix}\right\}N_2$, which is identical with $CO(NH_2)_2$, and possesses the advantage of showing the probable grouping of the elements in urea. Pure urea, which has been allowed to crystallize slowly, occurs in white, glistening, streaked, four-sided prisms; but when the crystallization is rapid or disturbed, it separates in small white silky needles. It is devoid of smell, has a coolish, bitter taste, like that of saltpeter (which it closely resembles in its external form), and is very slightly deliquescent. It is readily soluble in water and alcohol, but only slightly in ether. When heated to about 248° F. (120° C.), it fuses, evolves ammonia, and becomes completely decomposed. A solution of pure urea in distilled water may be kept for a long time, and may even be boiled without undergoing decomposition; but if heated in a close tube to about 284° F. (140° C.), each equivalent combines with four of water, and is converted into carbonate of ammonia, according to the formula—

$$\overbrace{CO(NH_2)_2}^{\text{Urea.}} + 2H_2O = \overbrace{(NH_4)_2CO_3}^{\text{Carbonate of Ammonia.}}$$

A similar change takes place slowly at ordinary temperatures in the urea contained in the urine, the mucus of the bladder acting as a ferment, and thus rendering urine ammoniacal after it has been kept for a few days.

The following are some of the most important of the compounds of urea: *Nitrate of urea*, $CO(NH_2)_2 \cdot HNO_3$, and *oxalate of urea*, $2CO(NH_2)_2 \cdot H_2C_2O_4$, are readily crystallizable salts, formed by the direct addition of the respective acids to a moderately strong solution of urea. As nitrate of urea requires eight parts of cold water, and is still more insoluble if an excess of free nitric acid is present, and the oxalate is more insoluble than the nitrate, while urea dissolves in its own weight of water, these salts may be employed to test for and approximately determine the quantity of urea. Among the compounds of urea with metallic oxides, those which it forms with the oxides of mercury are especially interesting, and have been completely examined by Liebig. A result of his researches is his celebrated method, which is now in universal use, of determined the amount of urea volumetrically.

Urea occurs as the main and characteristic ingredient of the urine of man and mammals, being most abundant in that of carnivorous, and least so in that of vegetable feeders. The average quantity excreted by the human subject is mentioned in the article URINE. It is also a constituent of the fluids of the eye, of the sweat, and (in minute quantity, of the blood, and of the liquor amnii (of the fetus). There can be no doubt that it is a final product of the regressive metamorphosis of the living tissues, or of their disintegration into simpler compounds, by means of which the final elimination of the worn-out structures is facilitated. Thus, we find that urea may be obtained by oxidizing agents from uric acid, creatine, allantoine, etc., in the laboratory, and there is every reason to suppose that similar changes may occur in the system. Whether, when an excess of food is taken, a portion of it may be formed in the blood into urea, and then at once separated without ever having entered into the structure of the higher tissues, is a point which is scarcely decided.

Until the discovery by Liebig and Wöhler of the artificial formation of urea, its only source was the urine, from which, after evoporation, the nitrate was separated, purified by animal charcoal, and the urea liberated by the addition of carbonate of baryta, and finally extracted by alcohol, from which it was allowed to crystallize. It is now known that there are many different ways of forming it, as (1) by the action of chlorocarbonic oxide or phosgene gas, $COCl_2$, on dry ammonia; or (2) by heating a mixture of ethyl carbonate, $(C_2H_5)_2CO_3$, and an alcoholic solution of ammonia to about 356° F. (180° C.), in a closed tube (both of which methods show that urea is truly the *amide of carbonic acid*); but the best practical method is essentially the original one of mixing watery solutions of potassium cyanate and ammonium sulphate, and evaporating the solution, which leaves a residue consisting of urea and potassium sulphate, the former of which may be extracted by alcohol.

URE'AS, THE COMPOUND, include a large class of singular organic bodies, for the knowledge of which chemistry is mainly indebted to Prof. Hofmann. Compounds of this kind are most readily formed by the action of cyanic acid on the amines or amidogen

bases of the alcohol radicals, such as methylamine, ethylamine, etc. (the methylia, etc., of Miller and other chemists), instead of on ammonias. Thus, while ordinary urea is formed by the action of this acid on ammonia, methyl-urea, ethyl-urea, etc., are formed by its action on methylamine, ethylamine, etc., as shown in the following formula:

Ammonia.		Cyanic Acid.		Urea.
NH_3	+	$HNCO$	=	$CO(NH_2)_2$
Methylamine.		**Cyanic Acid.**		**Methyl-urea.**
$CH_3 \cdot NH_2$	+	$HNCO$	=	$CO(NH_2)(NHCH_3)$
Ethylamine.		**Cyanic Acid.**		**Ethyl-urea.**
$C_2H_5 \cdot NH_2$	+	$HNCO$	=	$CO(NH_2)(NHC_2H_5)$

These are the simplest forms of these compounds ; among the more complicated ones are ethyl-methyl-urea, $CO(NH_2)(N \cdot CH_3 \cdot C_2H_5)$, phenyl-ethyl-urea, $CO(NH_2)(N \cdot C_2H_5 \cdot C_6H_5)$, etc. All these compound ureas combine like ordinary urea with acids, and form crystallizable salts.

URE'DO, a genus of minute parasitic fungi, of the order *coniomycetes*. The original genus uredo has been divided into many genera, forming a group called *uredineæ*, which contains a multitude of species, parasitic on phanerogamous plants of almost every natural order, and in all parts of the world, at the equator and at the extreme limits of arctic and antarctic vegetation. Different plants have their own peculiar parasites of this kind, or the same *uredineæ* are at least confined to plants nearly allied. A few species occur on ferns, but not very frequently. Every external part of plants, except the roots, is liable to be infested with these fungi, and some of them attack the inner tissues, their spores at length breaking through the outer strata of cells. Submerged parts of plants are never affected by them, for fungi dislike water; but the floating portions of aquatic plants are not exempt; and in all cases a moist atmosphere seems to be favorable to their development. Rank luxuriance of growth is often attended by their appearance. A plant once attacked is afterward subject, if perennial, to the same parasite, even if removed to another situation. There is reason to believe, from experiments made by Fée, that the spores of the *uredineæ* are taken up by the roots of plants from the soil, and find their way with the sap to the place proper for their growth. See Brand, Bunt, Mildew, Rust, and Smut.

URE'NA, a genus of herbaceous plants of the natural order *malvaceæ*. The bark is very fibrous; and the fiber of *U. lobata* and *U. sinuata*, weeds common in most parts of India, is used as a substitute for flax. It is strong, and tolerably fine.

U'RETERS (Gr. *ouron*, urine, and *tērein*, to keep), the canal by which the urine is conveyed from the pelvis of the kidney (see Kidneys) on either side to the base of the bladder. Each ureter is about 18 in. in length, and enters the bladder in so slanting a direction as to prevent regurgitation.

When a concretion is formed in the kidney, the ordinary and most favorable event is that it should descend through the ureter to the bladder. The passage of a stone through this tube gives rise to a series of violent symptoms, which are thus summed up by Druitt: "The patient complains of sudden and most severe pain, first in the loins and groin, subsequently in the testes (in the male) under the thigh. The testes are also retracted spasmodically. At the same time there are violent sickness, faintness, and collapse, which may last two or three days, and are only relieved when the stone reaches the bladder."—*The Surgeon's Vade-mecum*, 8th ed., p. 594. The treatment consists in the warm bath, and the inhalation of chloroform, or opium in large doses (both of which serve to allay spasm and deaden pain), the free use of diluents to wash down the concretion, and if the sickness is very severe, an occasional tumbler of hot water containing half a tea-spoonful of carbonate of soda.

URE'THRA is the term given in anatomy to the canal by which the urine is discharged from the bladder. Its most common affections are the special inflammatory condition of its mucous lining, known as gonorrhœa (q.v.), and stricture (q.v.).

URFA, or Orfa, the modern name of Edessa (q.v.).

URGA, a town, capital of northern Mongolia, on the river Tola, at the height of 4370 ft. above sea-level, 350 m. s.e. of Irkutsk. In one of the suburbs of the town is a college of Mongolian priests, which is the seat of the Lama of the Mongols. See Lamaism. The college or convent covers an extensive area, and includes the dwellings of the priests. The population is made up of a colony of Chinese and about 25,000 Mongols, 10,000 of whom are priests. Each family educates one of its children to be a priest. The buildings of the college have of themselves more the appearance of a town than the other quarters of Urga. The number of the inhabitants is estimated at 30,000.

U'RI, one of the Waldstätten or forest cantons of Switzerland, forms part of the hill country (see Switzerland) which surrounds the lake of Lucerne, and is bounded on the w. by the cantons of Unterwalden, Bern, and Valais. It has an area of 415 sq. m.

and its pop. in '70 was 16,107; in '94, 17,249. It consists of one valley, that of the Reuss, about 30 m. in length, and inclosed on all sides by lofty mountain chains, which also include the south-eastern bay or reach of the lake into which the river falls. A great high-road passes through the valley, and terminates on the south at the St. Gothard pass which connects Uri with Ticino, and forms part of one of the great routes into Italy. It is traversed by the St. Gothard railroad. Uri is almost entirely pastoral, and its products are those of its herds and flocks. Goats are very numerous. In the low grounds, there are a few fields of corn and potatoes, and gardens and orchards, but even this cultivation is limited. The population speak a Swiss-German dialect and are Roman Catholic. Uri sends one member to the national council. It joined with Unterwalden and Schwyz in the 13th century to form the Swiss confederation. It was the scene of various conflicts between the French, Russians, and Austrians in 1799, and became a canton in 1803. Altorf, the capital, is a small town, with about 3000 inhabitants. A fountain, surrounded by stone statues of Tell (q.v.) and his son, marks, according to tradition, the spot where the former took his aim, and another that where the boy stood with the apple on his head.

URI, BAY OF, or **LAKE OF**, or **URNER SEE**, in Switzerland, the s.e. arm of Lucerne lake with a length of about 8 m.

U'RIC or LITHIC **ACID**, $C_5H_4N_4O_3$, derives its names from its being a constituent of urine and of urinary calculi respectively. In a state of purity, it occurs in the form of a loose white powder or scales consisting of minute crystals, devoid of smell or taste, only very slightly soluble in water (1 part requiring about 15,000 parts of cold, and 1800 of boiling water), and quite insoluble in alcohol and ether. This acid is, however, soluble without decomposition in strong sulphuric acid, and it may be thrown down from this solution by the addition of water. It is also soluble in the carbonates, borates, phosphates, lactates, and acetates of the alkalies, extracting from these salts a part of their base, with which it forms acid urates. Litmus paper is reddened by its moist crystals, or by a hot watery solution. This acid is not volatile, and by dry distillation is decomposed into carbonate of ammonia, urea, cyanuric acid, hydrocyanic acid, etc. On heating a mixture of uric acid and water, with gradual additions of peroxide of lead, which is a strong oxidizing agent, the uric acid becomes oxidized, takes up water, and becomes converted into urea, allantoine, and oxalic acid, as is shown by the equation:

$$\overbrace{2C_5H_4N_4O_3}^{\text{Uric Acid.}} + \overset{\text{Oxygen.}}{O_2} + \overset{\text{Water.}}{5H_2O} = \overbrace{2CO(NH_2)_2}^{\text{Urea.}} + \overbrace{C_4H_6N_4O_3}^{\text{Allantoine.}} + \overbrace{2H_2C_2O_4}^{\text{Oxalic Acid.}},$$

the lead being left in combination with the oxalic acid. This is a most important result in its physiological bearing, since it shows how uric acid is a probable stage toward the formation of urea, and as explaining a probable source of the oxalic acid, which is often present in the urine in cases of deficient respiration and aeration; and this view is confirmed by the experiment of introducing uric acid into the stomach or veins of an animal, when the presence of oxalate of lime, and the augmentation of urea, are very soon perceived in the urine.

Uric acid is a very weak bibasic acid, forming with bases two series of salts, the neutral and the acid, of which the former are the more soluble. Among the most important of these urates are—(1) *neutral urate of potash*, which occurs in the form of a white granular crystalline powder, difficult of solution in water (requiring 44 parts of cold, and 35 of boiling water), but readily soluble in an excess of potash, from which solution carbonic acid throws down the *acid urate of potash* in the form of a transparent jelly, which sometimes falls in the form of a powder; (2) two *urates of soda*, each of which is less soluble than the corresponding potash salt; (3) *acid urate of ammonia;* (4) *acid urate of magnesia;* (5) two *urates of lime;* and (6) *urate of lithia*, which is more soluble than any other urate; and hence lithia water is an important therapeutic agent in converting uric acid and the more insoluble urates into a soluble salt in the living body.

Uric acid is widely distributed throughout the animal organism. It occurs not only in the urine of man and carnivorous animals, but is the chief constituent (either free or in combination) of many calculi occurring in the kidneys or bladder, and of numerous urinary sediments. The urinary secretion of birds and reptiles consists almost entirely of urates, which are also found in the excrements of caterpillars, butterflies, beetles, etc., and of many mollusks. Moreover, in very minute quantities, it occurs as a urate in healthy blood, in which fluid it has been found in excess in gout and Bright's disease, and is a constituent of the aqueous extract of the spleen, liver, lungs, pancreas, and brain. The *chalk-stones* occurring about the smaller joints, and in the lobes of the ear of gouty patients, consist mainly of urate of soda.

The best and most ready mode of obtaining pure uric acid is from the semi solid urine of serpents, which consists almost entirely of urates. The mass is boiled with

potash, which expels any ammonia that is present, and a stream of carbonic acid is then passed through the strained potash solution, which throws down acid urate of potash. This precipitate is dissolved in water, and decomposed by hydrochloric acid, which throws down the uric acid in minute crystals. The form in which this acid crystallizes is liable to great variations. Sometimes we have flat tablets resembling whetstones, or sections with a double knife through biconvex lenses; at other times, more or less perfect rhombic tablets, and sometimes hexagonal plates, barrel-shaped prisms, and toothed crystals. If there is any doubt as to the nature of the crystals, they should be dissolved (under the microscope) in a little potash solution, and a drop of hydrochloric acid then added, when sufficiently characteristic forms are sure to appear.

The marvelous researches of Wöhler and Liebig on the products of decomposition of uric acid by nitric acid, constitute an epoch in organic chemistry. The most important products, some of which are obtained directly, and others indirectly, are: (1.) *alloxan*, $C_4H_2N_2O_4$ (which, under the influence of various reagents, yields *alloxanic acid*, *mexoxalic acid*, *mykomelinic acid*, and *dialuric acid*); (2) *parabanic acid*, $C_3H_2N_2O_3$ (which yields *oxaluric acid*); (3) *alloxantine*, $C_8H_4N_4O_7 + 3H_2O$ (which yields *alloxan*, *allituric acid*, *uramel*, *thionuric acid*, *oxaluric acid*, and *murexide*); (4) *murexide*, $C_8H_4N_5O_6 \cdot NH_4 + H_2O$ (which yields *murexan*, or *uramel*, and *alloxan*); and (5) *urea*, which breaks up into carbonic acid and ammonia. Moreover, by boiling oxaluric acid with water it is decomposed into oxalic acid and urea. Of these substances, we shall only notice *murexide*, which has two special claims to notice. It is used as a pigment in dyeing, being probably the old *Tyrian purple* (see MUREXIDE), and it affords a ready test for a mere trace of uric acid. In using it for the latter purpose, the substance supposed to contain uric acid is heated on a slip of glass with a drop of nitric acid, and carefully evaporated to dryness. If uric acid is present, the residue has a red color, which is converted by vapor of ammonia into a fine crimson, and the addition of a drop of a solution of potash develops a splendid purple tint, which disappears on the application of heat.

Uric acid must be regarded, like urea, as a product of the disintegration of the tissues; and it is far from improbable that all the urea which is secreted may have pre-existed in the form of uric acid—a view which is supported by the fact, that whatever (like excessive exercise or water-drinking) increases the amount of urea, decreases that of uric acid, and *vice versâ*. See URINE.

URICO'NIUM, an ancient Roman city of Britain, the site of which is about 4 m. to the e. of Shrewsbury, and is partly occupied by the village of Wroxeter. The original name seems to have been *Viroconium*, which was changed in the later Roman-British period to Uriconium. It is mentioned by Ptolemy as existing in the beginning of the 2d c. A.D. The remains of the city show it to have been a place of much importance. The wall can still be traced near the banks of the Severn, forming an irregular oval rather more than 3 m. in circumference. It appears that one of the principal streets of the city occupied the line of the *Watling street road*. The remains of Uriconium have recently been explored by an association formed for the purpose at Shrewsbury, and many curious relics of antiquity have been discovered, throwing great light on Roman civilization in Britain. The human remains found in the excavations which have been made, affording proof of death by violence or by suffocation, show that the city did not slowly decay, but was sacked and burned by enemies, which probably took place about the 5th century. Of this, however, there is no certain historic record. The ruins seem to have remained with little change, except the gradual process of decay, till about the 12th c., when they were used as materials for other buildings. Some of the churches of the neighborhood were built of the old Roman bricks. The walls of buildings are now found, perfect as far as the previous accumulation of earth rendered it difficult to remove the bricks of which they were constructed. The most remarkable relic of antiquity in Uriconium is the *old wall*, a great mass of Roman masonry, which appears to have been the side of a great edifice, remains of Mosaic pavements having been found near it, and apparently connected with it. The edifice to which the old wall belonged is supposed to have occupied a corner at the junction of two principal streets. The excavations which have been made, however, leave it very difficult to explain the character and purpose of the remains discovered. Several inscriptions have been found at Uriconium, but none of great interest. A museum has been formed at Shrewsbury, in which most of the antiquities from this spot are collected. Hair-pins, combs, and rings are particularly numerous among them.

U'RIM AND THUM'MIM (Heb.), a mysterious contrivance in or on the high-priest's breast-plate, either consisting of the four rows of precious stones upon which the names of the 12 tribes were engraved, or of two images personifying—most probably—"Truth" and "Revelation." Luther's translation, "light and truth," has no more real foundation than that of the LXX. and the Vulgate, which is "utterance and truth." To this translation, the fact of the picture of "Truth" (Aletheia)—in sapphire or other precious stones—being suspended from the Egyptian high-priest's breast, had probably given rise. The etymology of the two words, which, derived from Arabic roots, would indicate "brilliant amulet," "perfect light," etc., is in reality no more satisfactory than the account of the manner in which the contrivance was used for oracular purposes, or of the time when, in reality, it ceased to act. It is never mentioned after Solomon's time.

U'RINARY SEDIMENTS is a general term which includes all those substances which occur in a non-dissolved state in the urine. Most of these sediments are not formed until after the urine has been discharged and has cooled; some, however, are formed in the urinary organs, and under favoring conditions may give rise to urinary concretions. Hence it is a point of importance to ascertain whether a sediment occurring in a specimen of fresh urine has been formed before or after its discharge.

The chemical and microscopical character of these sediments has a double bearing on the detection of disease: (1.) "From the investigation of these sediments," says professor Vogel, "we can draw sure conclusions regarding special changes that are going on in the general nutrition of the body. They show us that an excessive quantity of certain substances (as for example, uric, hippuric, or oxalic acid) is being discharged with the urine, and has therefore been produced in the body; and we thus often obtain at a glance information of great importance, which could otherwise only be procured by a tedious process; and (2) they point out to us certain local diseases of the urinary system. Thus, from a sediment containing pus, we infer that suppuration in going on in some part of that system; and the presence of cylindrical casts or tubes in the sediment informs us of certain morbid changes in the structure of the kidneys; and if the ordinary symptoms reveal the presence of stone in the bladder, we can ascertain its probable nature from the character of the sediment or gravel."

The mode of formation of morbid sediments is well illustrated by a sketch of the changes which healthy urine undergoes after prolonged exposure to the air. In the course of two or three days, the acidity of the urine is found to have increased, and this condition of *acid fermentation* will frequently continue for some weeks, giving rise to the deposition of (1) free uric acid; (2) acid urates (chiefly urate of soda); and (3) oxalate of lime. In a few weeks, or often much sooner, the urea becomes alkaline, or *alkaline fermentation* is established, in consequence of the urea being converted into carbonate of ammonia. The urine now becomes paler, while the red or yellow crystals of uric acid are replaced by white amorphous granules and colorless refracting prismatic crystals. In other words, the former precipitate is replaced by (1) phosphate of ammonia and magnesia (commonly known as triple phosphate); (2) phosphate of lime; and (3) urate of ammonia. In certain forms of disease, these changes take place much more rapidly, and the second change—the alkaline fermentation—may occur without a pre-existing acid fermentation, and even within the bladder. In addition to the above-named substances, which arise from the decomposition of healthy urine, others occur in various morbid conditions of the system; and we may divide the urinary sediments generally into the two great groups of (1) the unorganized and (2) the organized deposits. The unorganized sediments include uric acid, the urates (chiefly urate of soda), hippuric acid, oxalate of lime, earthy phosphate (viz., phosphate of lime, and triple phosphate), crystine, xanthine, pypoxanthine (formerly known as guanine), and tyosine; while the organized sediments include mucus and epithelial scales, blood corpuscles, pus corpuscles, cancerous and tubercular matter, fibrinous casts of the tubes of the kidney, spermatozoa, fungi, infusoria, etc. Of the unorganized sediments uric acid, the urates (excepting urate of ammonia), hippuric acid, and crystine occur only in acid urine, and urate of ammonia, triple phosphate and phosphate of lime, in alkaline or neutral urine. Oxalate of lime and the organized sediments occur both in acid and alkaline urine; but alkaline urine is the more natural *habitat* for fungi and infusoria. It is comparatively seldom that a sediment consists of a simple ingredient. Most of our knowledge on this important subject is due to the labors of English physicians, among whom the names of Prout and Golding Bird are especially deserving of notice. For details regarding the mode of treatment suitable in the most important of the sediments, we may refer to the articles Lithic Acid Diathesis, Oxaluria, and Phosphatic Diathesis, in this work, and to Dr. G. Bird's *Urinary Deposits and their Treatment;* while for details regarding their chemical and microscopical characters, Neubauer and Vogel, *On the Urine,* translated under the auspices of the New Sydenham society, may be consulted.

U'RINE is the fluid which is secreted or separated by the kidneys from the blood, and it is the principal means of removing the worn-out tissues, especially the nitrogenous and saline matters, from the system. It is a very complex fluid, and its composition varies considerably in different classes of animals, and mainly in accordance with the nature of the food.

Healthy human urine, when freshly discharged, is a clear fluid of a bright amber color, a bitter, saltish taste, and a peculiar aromatic odor. Its normal reaction is acid, and its specific gravity ranges from 1.015 to 1.025. From a table published in Day's *Physiological Chemistry,* p. 352, it appears that an adult man of ordinary weight (about eleven stones) secretes in 24 hours about 52 fluid ounces (or rather more than two pints and a half) of urine, the range extending from 40 to 70 ounces; and that these 52 ounces yield, on evaporation, 935 grains of solid constituents, the remainder being water, which is expelled by heat. Of these 935 grains, 520 (or more than an ounce) are composed of urea (q.v.), and 266 of chloride of sodium (or common salt); while the remaining 149 grains are made up of uric acid (q.v.), hippuric acid (q.v.), sulphuric acid, 32 grains; phosphoric acid, 54 grains; earthy phosphates, 15 grains; ammonia (in the form of hydrochlorate), 11 grains; with smaller quantities (in most cases mere traces) of creatinine

(q.v.) and creatine (q.v.), xanthine, hypoxanthine, coloring matters, mucus (from the walls of the bladder), iron, silica, and fluorine. The fluid also holds an undetermined quantity of gases (carbonic acid and a little nitrogen) in solution. The most characteristic and important of these ingredients is the *urea*, the daily excretion of which is modified by various circumstances. On a purely animal diet, Lehmann found that he secreted two-fifths more urea than when he was living on an ordinary mixed diet; while on a mixed diet there was secreted almost one-third more than on a purely vegetable diet; while finally, on a non-nitrogenous diet, the amount of urea was less than half the quantity secreted during a mixed diet. The free use of common salt increases the daily excretion of urea, in consequence, doubtless, of its augmenting the rapidity of the destructive action always going on in all the tissues; while alcohol, tea, coffee, and tobacco (whether smoked or chewed) diminish the daily quantity. The only medicine which increases its quantity to any marked degree is *liquor potassæ*. The daily quantity is increased in many diseases (typhoid fever and many other acute diseases, especially inflammation of the membranes of the brain), while in Bright's disease and a few other disorders, it is diminished. The daily amount of excreted *uric acid*, like that of urea, varies with the nature of the food. Thus, for instance, Prof. Haughton found that the mean daily quantity of uric acid excreted by meat-eaters and wine-drinkers was 4.5 grains, while vegetarians yielded an average of only 1.48 grains, part of which, moreover, was hippuric acid. As an excess of uric acid is likely to give rise to gravel or stone, it should be generally known that the free ingestion of water diminishes its excretion, while at the same time it increases the amount of urea, into which the uric acid is probably transformed by oxidation. The daily amount is diminished by strong bodily exercise, and increased by repose; the reverse of what holds good in relation to the urea. The amount is increased when the digestive functions are disturbed, as after the use of indigestible food or excess of alcoholic drinks; in those conditions of the system which are associated with much disturbance of the functions of respiration and circulation; and in disorders accompanied with severe febrile symptoms, such as acute rheumatism. Its entire absence seems compatible with perfect health. With regard to *hippuric* acid there has been much discussion, not only as to the quantity in which it occurs, but as to whether it actually exists in healthy urine. Thus, Weissman, a German chemist, finds that on a mixed diet he secreted more than 40 grains of this acid daily, and on a purely animal diet, only 12 grains. Duchek and Höfle deny that it is a constant ingredient of healthy human urine; and Prof. Haughton only met with it once in the urine of ten men. Dr. Bence Jones, a very trustworthy chemist, found that a man, A, weighing 152 lbs., and a man, B, weighing 202 lbs., living on a mixed diet, excreted daily, on an average, 4.9 and 6.5 grains of hippuric acid, the corresponding quantities of uric acid being 7.7 and 12.6 grains. In cases of jaundice, no traces of hippuric acid are present, even after the administration of benzoic acid,* which is usually converted in the system into hippuric acid. Hence it may be inferred that a healthy condition of the urine is essential to the formation of this acid in the system. Nothing is known with certainty regarding the diseases in which this acid is secreted to excess. The only other characteristic ingredient of the urine is its *coloring matter*. Prof. Harley believes that he has isolated the normal urine-pigment, to which he applies the term *urohæmatin;* and from its always containing iron, and on other grounds, he regards it as modified hæmatin or blood-pigment. Mr. Schunck has also shown that indigo-blue, in very small quantity, is almost always present.†

It has been already stated that fresh healthy human urine presents an acid reaction. This reaction mainly depends upon the presence of acid phosphates of the alkalies and earths, although the presence of free acids, such as free hippuric, or possibly lactic acid (which, however, is not a normal ingredient), may occasionally contribute to increase the acidity. To determine the acidity of the collective 24 hours' urine, we take a solution of oxalic acid of known strength, and ascertain the relative quantities of a solution (of definite strength) of caustic soda which are required to perfectly neutralize equal volumes of the urine and of the oxalic acid solution. In this way it is found that the total quantity of free acid in the daily urine of a healthy man corresponds in neutralizing power to about 36 grains of oxalic acid. The degree of acidity varies in different parts of the day. Dr. Bence Jones mooted the idea (in 1849), that the respective acidities of the secretions of the kidneys and stomach stood in an inverse relation, and that urine may even become alkaline during stomachal digestion. Dr. Roberts of Manchester, who has subsequently investigated this point, finds that the effect of a meal on the acidity of the urine begins to show itself in the second hour afterward, is most marked during the next three hours, and disappears by the end of the sixth hour, the fluid being almost always positively alkaline during the third and fourth hours. Independently of this periodic alkalinity, the urine may be made alkaline at will by the administration of caustic alkalies, their carbonates or their salts, with organic acids (citrates, tartrates, etc.; such

* Duchek found that when 1 gramme (15.44 grains) of benzoic acid was taken, 0.714 of a gramme of hippuric acid was excreted; when 2 grammes were taken, 1.857 grammes of hippuric acid, and 0.421 of benzoic acid, were excreted; and the ingestion of 4 grammes was followed by the excretion of 1.714 of hippuric acid and 2.500 of benzoic acid. Hence the limit of conversion had been already exceeded.

† He failed to detect it in only one case out of forty. He only succeeded in obtaining *one grain* by working for several weeks on the urine of two persons. The urine of the horse and cow yielded comparatively large quantities.

as occur in many fruits); while after the administration of acids the acidity is much increased.

In disease, the urine may either contain only its ordinary ingredients in abnormal proportions, or it may contain ingredients not occurring in the healthy fluid. Thus there may be an excess or diminution of urea, an excess of uric acid, a diminution of chloride of sodium, which, in cases of inflammation of the lungs, may fall from 266 grains to a mere trace, and, by its daily diminution or augmentation, tells with certainty whether the disease is gaining or losing ground; an excess of coloring matter or of mucus, etc.; or, on the other hand, the urine may contain albumen, sugar, oxalic acid (in combination with lime), fat, leucine and tyrosine, bile-pigment, biliary acids, etc. The subject of "the urine in disease," is, however, so wide a one that we must refer our readers for details to Lehmann's *Physiological Chemistry*, 3 vols. (translated for the Cavendish society), to Dr. Parkes's excellent work on *The Urine*, and to the various works of Dr. Beale.

We conclude with a few remarks on the urine of mammals generally. The urine of the carnivora is clear, of a light-yellow color, a disagreeable odor, a nauseous taste, and an acid reaction. It contains much urea, little pigment, and little or no uric acid. The urine of the herbivora is turbid, yellow, of a less unpleasant odor, and alkaline. In addition to urea, it contains hippuric (but no uric) acid, alkaline lactates, carbonates of potash and of the earths, oxalate of lime, and a small quantity of phosphates. By reversing the natural food of these classes, we reverse the characters of the urine.

The urine in many forms of disease becomes turbid on cooling, and soon deposits a sediment; and even healthy urine, after a few days's exposure to the air, loses its clearness, and throws down a deposit of mucus and various kinds of crystals. The investigation of the nature of the deposits thrown down by comparatively fresh urine in disease, is noticed in the article URINARY SEDIMENTS.

URINE, INCONTINENCE OF, or ENEURESIS, is a troublesome affection, far more common in childhood than in more advanced life. The child may have no bad symptom of any kind that can be detected, but it is in the constant habit of discharging its urine in bed during sleep. It sometimes wakes with a consciousness that it is performing the act, but most commonly it is not disturbed. The act may take place once, or several times, during the night, and sometimes there is an interval of a night, but seldom more. The child may often be broken off this unpleasant habit by proper domestic management, as withholding any excess of fluids before going to bed, and by waking it, and making it discharge the contents of the bladder at the time when the elder members of the family retire to bed. When such means as these fail, recourse must be had to medical advice. Blisters to the sacrum, which prevent the patient from lying flat on the back, and consequently prevent the urine from gravitating toward the most irritable part of the bladder, are often useful; and cold douches to the spine, combined with the internal use of chalybeates, are frequently serviceable. The most certain remedy, however, is extract of belladonna, given at first, according to the age of the patient, in doses varying from $\frac{1}{16}$ to $\frac{1}{8}$ of a grain, twice daily, and increasing it, if required, till it gives rise to marked constitutional disturbance.

The various forms of mechanical pressure that have been suggested, with the view of preventing the passage of the urine, cannot be too strongly reprobated.

URNER SEE. See URI, BAY OF.

UR'QUHART, DAVID, b. Scotland, 1805; educated at St. John's college. In 1835 he was secretary of legation at Constantinople, but opposed Palmerston's eastern policy and therefore resigned his position. He sat in parliament as conservative member for Stafford, 1847–52. He is the author of *Turkey and its Resources*, *The Mystery of the Danube*, and other books bearing on the eastern question. **He d. 1877.**

URQUIZA, JUSTE JOSÉ DE, 1800–70; b. Entre Rios; of Spanish and Indian descent. In the La Plata war he was general of division under Rosas. In 1840 he led the Uruguay invasion, and in 1845 won the victory of India Muerta. In 1857, then being governor of Entre Rios, he became involved in quarrels with Rosas, head of the Argentine confederation, raised an army from Brazil, Paraguay, and Uruguay, routed Rosas at Santos Luzares, and made himself dictator of the Argentine republic. From 1854 until his death he was engaged in war with Buenos Ayres, and was generally unsuccessful. He was assassinated April 11, 1870.

URSA MA'JOR, "the Greater Bear," and URSA MINOR, "the Lesser Bear," are two celebrated constellations in the northern hemisphere of the heavens. *Ursa Major* was distinguished as early as the time of Homer by the names *Arktos*, "the Bear," and *Hamaxa*, "the Wagon," the vivid imagination of the Greeks discovering a fanciful resemblance between these objects and the group of brilliant stars in this constellation. The Roman name Ursa was a translation of the Greek *Arktos;* the Romans also called its seven bright stars the *Septemtriones*, "the seven plowing oxen," whence the adjective *septentrionalis* came to signify north. The common names throughout Europe for these seven stars are "the Plow," "Charles's Wain," "the Wagon"—evidently derived from the classical epithets above mentioned. When the constellation of Ursa Minor was generally recognized, the adjective *megale*, "great," was annexed by the Greeks, and *major*, "greater," by the Romans, to the name of this constellation. The remarkable

group of stars in the hinder part of the Great Bear being within 40° of the north pole, never sinks below the horizon of any place in a higher n. latitude than 40°, a peculiarity alluded to by Ovid in his *Metamorphoses*. It contains a considerable number of stars, 17 of which are easily visible by the naked eye; but of these, only one (α) is of the first magnitude, two (β and γ) of the second, and eight (among whom are δ, ε, ζ, and η) of the third. Of the seven stars constituting "the Plow," α and β are known as "the Pointers," from their use in detecting the *pole-star* (q.v.). A line drawn from the pole-star through η of the Great Bear, and produced its own length, passes close to the star Arcturus of the first magnitude.—*Ursa Minor* is less prominent in the heavens. It was also *Arktos* and *Hamaxa* among the Greeks, and *Arctus* and *Ursa* among the Romans, from the close resemblance of its chief star-group to that of Ursa Major; but was, besides, distinctively denominated *Kynosoura* or *Kynosouris*, and *Cynosura*, "the Dog's Tail," from the circular sweep, resembling the curl of a dog's tail, formed by three of the stars in it. The star α in the extremity of the tail of the Little Bear, at present the pole-star (q.v.), is the brightest in the constellation, though only of the third magnitude.

According to the later mythical stories of the Greeks, Ursa Major was the metamorphosis of Callisto, one of Diana's nymphs, who, having violated her vow, and being transformed by her indignant mistress into a bear, was slain by her son Arcas, and afterward transferred to the heavens as a constellation by Jupiter; Arcas being at the same time metamorphosed into Boötes, the Arktophylax, "Bear-warden," of the Greeks. According to the other but less common legend, which represents the seven stars of Ursa Major as the oxen of Icarius, Arktophylax became *Boötes*, "the Ox-driver."

URSIDÆ. See Bear.

URSON, *Erythizon dorsatum*, a quadruped nearly allied to the porcupine, and often called the Canada porcupine. The genus *erythizon* differs from *hystrix* (porcupine) in the flatter head, the shorter and not convex muzzle, the longer tail, and in having the quills short and half hidden in the hair. The urson is about the size of a small hare. It is found as far s. as Virginia and Kentucky, and as far n. as lat. 67°. Its quills are dyed by the Indian women, and worked into ornamental articles of various kinds.

URSULA, St., a celebrated saint and martyr of the Roman calendar, especially honored in Germany, and particularly at Cologne, which is the reputed place of her martyrdom. The legend substantially, in its present form, can be traced as far back as the end of the 11th or beginning of the 12th c., as it is found in the revised edition of the Chronicle of Sigebert of Gemblours (Pertz, *Rerum Germanicarum Scriptores*, viii. 310), which was made between 1106 and 1111. According to this writer, Ursula was the daughter of the British king Deonatus; and on account of her distinguished beauty, was sought in marriage by the son of a heathen prince who was originally named Holofernes, but afterward, when a christian, was called Ætherius. Her father was forced to yield to the demand; but Ursula made it a condition that her suitor should become a Christian, and that she should be allowed a space of three years, during which she proposed, in company with her maidens, to each of whom should be assigned a thousand companions, and a three-oared galley to convey them, to make a voyage of pious pilgrimage. The conditions were accepted; the maidens, to the number of 11,000, were collected from all parts of the world; and at length the expedition set sail from the British coast. Arriving at the mouth of the Rhine, they sailed up the river to Cologne, and thence upward to Basel, where, leaving their galleys, they proceeded by land to visit the tombs of the apostles at Rome. This pilgrimage accomplished, they descended the river to Cologne, which, however, had meanwhile fallen into the hands of an army of Hunnish invaders, under the headship of a chief, who, although not named, is plainly the Attila of history. Landing at Cologne in ignorant security, the pious virgins fell into the hands of these barbarous heathens, by whom they were all put to the sword with the exception of Ursula, who, for her beauty's sake, was reserved as a prize for the chief. She, too, however, as well as another maiden who had at first concealed herself in terror, demanded to join her companions in martyrdom; and thus the full number of 11,000 victims was made up. Heaven, however, interposed. A host of angel warriors smote the cruel Huns; Cologne was again set free; and in gratitude to their martyred intercessors, the citizens erected a church on the site still occupied by the church now known under the name of St. Ursula. Such is the legend as told by Sigebert, although it has undergone some modifications in later hands. The improbabilities and anachronisms of this legend were early observed; and it became the subject of an animated controversy soon after the reformation. On the one hand, the centuriators of Magdeburg exposed its weak points with unsparing severity; on the other, a Jesuit father, Crombach, devoted an entire folio volume to the vindication of the substantial truthfulness of the narrative. Many suggestions have been offered as explanations of its most startling improbability—viz., the alleged number of the martyred victims, 11,000. One of these is, that this belief arose from the name of a virgin who was really the companion of Ursula's martyrdom—*Undecimilla*. The record of the martyrdom in the calendar thus being "Ursula et *Undecimilla VV.*, "Ursula and Undecimilla Virgins," was easily mistaken for "Ursula et *Undecim millia VV.*," "Ursula and *eleven thousand virgins.*"

Secular inquirers into the origin of the Ursula legend deny that it has the slightest foundation in any historical facts. They find the first traces of the reverencing of these

virgins in martyrologies and missals of the latter half of the 9th c., in which mention is made either of a very small number of virgins whose names are given, or a larger indefinite number without names. In one metrical martyrology of this period, by Wandalbert, a monk of Prüm, they are already spoken of as thousands; and after the end of the 9th c. the number of 11,000 is found in the calendars. The name of Ursula, however, does not occur till after the 10th c.; and it was not till the 12th c. that the reverence for Ursula became predominant over that of the associate virgins. With the 12th c. begins the discovery of the sacred bones. The *ager Ursulinus* was revealed by a vision in 1106; and at first, single skeletons were raised with the greatest solemnity; but beginning with 1155, the digging up of the field was carried on systematically for nine years, in the course of which thousands of skeletons were found, male as well as female, besides coffins, stone tablets with inscriptions, and the like. What the several relics were was revealed to a nun named Elizabeth, then living in the diocese of Trier, to whom the holy martyrs appeared in visions. In this way were identified a pope of the name of Cyriacus, an archbishop, several cardinals, bishops, and priests, and also Ætherius, Ursula's bridegroom, along with whose title the cross, a crown, and other royal insignia were represented. It was also explained how all these men came to be in the company of the pious virgins. Even the children's bones found among the others were accounted for by revelations made forty years later to an abbot at Arnsberg, which confirmed and supplemented those of Elizabeth. The numerous human remains found in the Ursulan field at the north side of the city have been accounted for by antiquaries, by making it out to have been the burying-ground of the ancient Roman *Colonia Agrippina*. The origin of the legend is accounted for by Schade in his work *Die Saga von der Heiligen Ursula* (Han. 1854), on the theory that it is a Christianized relic of old German paganism, in which Ursula has taken the place of the ancient goddess worshiped by the Scandinavians as Freyja (q.v.), and still remembered by the German people under the names of Berchta (q.v.), Hulda (q,v.), etc., and in Sweden by the very title of "Old Urschel."

But without pursuing further this curious inquiry, it will be enough to say, as concerns the Roman Catholic view of the matter, that while the most learned of the Catholic hagiographers, putting aside the idea of a directly and intentionally invented narrative, have traced the origin of the legend to a real historical massacre of a very large number of Christian maidens, which took place during the invasion of Attila, and soon after the celebrated battle of Chalons in 451, all the modern writers of that church are agreed in regarding the details of the narrative, the number, the pilgrimage to Rome, the interposition of the heavenly host, etc., as legendary embellishments of the mediæval chroniclers.—See, for the full exposition and vindication of the history, Crombach, *Ursula Vindicata* (fol. Coloniæ, 1647); and for a more critical exposition of the historical foundations on which it rests, Binterim's *Calendarium Eccles. Germ. Colon.* (1824); *Zeitschrift für Phil. u. Kathol. Theologie* (1850); Kellerhoven, *La Légende de Sainte-Ursula* (1862).

URSULINES, a religious order of females in the Roman Catholic church, taking their name from the saint and martyr who forms the subject of the above article. They take their origin from Angela Merici, a saint of the modern church, b. according to the more received account, at Desenzano, in the latter part of the 15th century. She formed at Brescia an association of young females who bound themselves by a vow to labor for the tending of the sick, the instruction of children, the relief of poverty, and other such works of charity. After a time, a rule, in twenty-five chapters, was projected by Angela, and finally approved by the bishop of Brescia, cardinal Francis Cornaro. Angela was herself chosen as the first superior, in the year 1537, the community even at that time numbering as many as 76 sisters. During the lifetime of Angela, and for more than twenty years after her death, which occurred in 1540, the congregation was confined to the diocese of Brescia; but in the year 1565, a house was opened at Cremona; and with the approval of popes Gregory XIII. and Clement VIII., it was spread over many dioceses of Italy. It was warmly encouraged by St. Charles Borromeo, and at his death there were no fewer than 28 convents of the order in his diocese, comprising above 600 nuns. Soon afterward, it was established in France, where one of its most distinguished members was the celebrated sister, Madeleine de St. Beuve. It was in France that the sisters, although from the beginning they had been engaged in teaching, first formally added to their religious vows that fourth vow to devote themselves to the instruction of female children, which has since formed the great characteristic of the order. They were introduced into Savoy by St. Francis de Sales in 1635; and in 1639, a convent was opened in Quebec, in Canada. About the same time, they were introduced into Germany—at Vienna in 1660, and at Freiburg, Kitzingen, and Prague soon afterward—where they have continued to teach with great success; and their convents in various parts of Germany, but especially in Austria, at present number 36. The Ursuline sisters have several educational establishments in Ireland, in England, and in the United States, and may fairly claim the merit of having been mainly instrumental in maintaining among Catholics the education of female youth of the higher order through the 17th and 18th centuries. They have found many competitors among the younger sisterhoods of modern times.—See *Journal des Illustres Religieuses de l'Ordre des de Ste. Ursule*, 4 vols. 4to (1690); *Chroniques de l'Ordre des Ursulines*, 2 vols. (Paris, 1676).

URTICA'CEÆ, or URTI'CEÆ, a natural order of exogenous plants, consisting of trees, shrubs, and herbs, natives of almost all parts of the world. According to many botanists, the order includes about 600 known species; while others, restricting it by separating from it several distinct orders, reduce it to about half that number, of which the common nettle may be regarded as the type. The leaves of all are alternate, furnished with stipules, and generally very rough, sometimes with stinging hairs. The inflorescence is various; the perianth usually divided, but sometimes a mere scale; the stamens inserted into the perianth, equal in number to its segments, when it is divided, and inserted at their base; the ovary free, one-celled, containing a single ovule. The fruit is a kind of nut, surrounded by the persistent and sometimes fleshy perianth, sometimes winged; and sometimes the fruits are variously aggregated. Under this description are comprehended *cannabinaceæ* (q.v.), *ulmaceæ* (q.v.), *moraceæ* (q.v.), and *artocarpaceæ* (q.v.), as well as the restricted urticaceæ, which have filaments curved in bud, and turning backward elastically when the anthers are bursting, the fruit an unopening nut. The juice of the restricted urticaceæ is watery, not milky; the wood in the arboreous or shrubby species, which are all tropical, is remarkably soft and light. The fiber of the bark of some is valuable. It is among the restricted urticaceæ that species covered with stinging hairs are found. See BŒHMERIA, NETTLE, NEILGHERRY NETTLE, and PELLITORY.

URTICA'RIA. See NETTLE-RASH.

URUGUAY', otherwise BANDA ORIENTAL DEL URUGUAY—i. e., "the eastern bank of the Uruguay," is a small South American state, bounded on the n. and n.e. by Brazil, on the e. and s.e. by the Atlantic, on the s. by the Rio de la Plata, and on the w. by the Uruguay. It is nearly square in shape, and its greatest length and its greatest breadth are over 300 miles. Area, 72,110 sq. m.; pop. '95, (est.) 792,800. Uruguay is divided into nineteen provinces. In the south, all along the Rio de la Plata, and as far north as the Rio Negro, the country is a sort of terraced upland, with a bold, broken treeless coast-line, possessing some excellent harborage; while the shores facing the Atlantic are low and sandy. Further east, rises a woody plateau; but high, bare, grassy plains, traversed by ranges of low hills, seem to be the predominant feature. The climate is mild; rain falls pretty copiously in winter, but is rare in summer. The most important rivers are the Rio Negro, the Daiman, the Arapey, the Yaguaron, and the Sebollati. The wild animals embrace the tapir, deer, ounce, monkey, paca, rabbit, and fox; and large packs of wild dogs infest the plains. Although the soil is naturally fertile, agriculture is in a backward condition, and the chief industry of the country is the raising of cattle and sheep. The lands are, for the most part, held in large estates, and the owners are content with the revenues derived from the large flocks and herds. Where wheat is grown the crops are excellent, but not much attention is devoted to raising it. Alfalfa is among the leading feed crops and grows abundantly. Manufactures are not important, nor is the foreign trade of Uruguay considerable. Of late years much attention has been given to grape growing, and the annual yield is on the increase. The imports consist largely of manufactures and food products, and the exports of animals and animal products. With the United States the export trade in 1896 amounted to about $742,000, and the import trade to about $857,000. The constitution of Uruguay was formed in 1830. The form of government is republican, the executive being vested in a president, chosen for four years, and the legislative in a parliament of two houses.

Uruguay was originally colonized by Spanish settlers from Buenos Ayres, on the other side of the La Plata; but the territory which forms the natural limit of Brazil on the south was claimed by Portugal, and a war ensued between the two nations for its possession which terminated in favor of Spain. Uruguay was now attached to the viceroyalty of Buenos Ayres, and received the name of *Banda Oriental*—i.e., as has been explained above, the country on the eastern bank of the Uruguay. Its independence was secured by treaty in 1828, when it took the title of *Republica del Uruguay Oriental;* but, like most of the South American republics, it has suffered frequently from internal discords.

URUGUAY RIVER, in South America, rises in the province of Santa Catharina, Brazil; after a course of about 70 m. n., increased by the Pelotas, the Pepiri-Guaçu, and other streams, turns s.; flows between the Argentine provinces of Entre-Rios and Corrientes, and the Brazilian province of São Pedro; is joined by the Ibicui, by the Quaraim, which is 160 m. long, and separates Uruguay and Brazil. At this point the Uruguay is 1500 yards wide; and from here to its mouth is the boundary line between Uruguay and the Argentine republic. It is joined by numerous tributaries, of which the Rio Negro is the largest, and in lat. 34° unites with the Parana to form the Plata. It is navigable for flat-bottomed steamers for about 500 m., and has a total course of about 1000 miles.

URUMEYAH, a t. of Persia, province of Azerbaijan, 70 m. w.s.w. of Tabriz, in a wide and fertile plain. Extensive fruit and vegetable gardens are situated both within and without the walls. The houses of the better classes are lofty, spacious, and sumptuously furnished; and many of those of the poorer classes are tastefully adorned with flowers and vines. Urumeyah has a flourishing Protestant mission; it has a pop. of about 25,000, a large number of whom are Nestorian Christians and Jews. Urumeyah was anciently known as *Thabarma*, or *Thebarmæ*, and was held in great veneration by the

Persians, by reason of the legend which fixed it as the birth-place of Zoroaster (q. v.). In 624 A.D. the town, including a magnificent fire-temple, was destroyed by the emperor Heraclius.

URUME'YAH, URUMIJAH, URMEA, LAKE, called also the *lake of Maragha* (q.v.), *lake of Tabriz*, and by the neighboring peoples *Kapauta* (Armen. *kapoit*, blue), the principal lake of Persia, is situated in the west of Azerbijan, about 64 m. s.w. from Tabriz. The lake, which is 4320 ft. above sea-level, is about 80 m. in length from north to south, has an average width of 25 m., and contains about 1420 English sq. miles. It is one of that class of lakes which receive but do not emit streams; and despite the fact that its feeders include such rivers as the Aji-su, 180 m. long; the Jage-tu, 140 m. long; and the Ta-tu, 90 m. long, it has only an average depth of 12 feet. The water is largely impregnated with saline substances (according to one authority, the salts constitute 25 per cent of the whole weight), and is so heavy as to be little ruffled by the strongest wind. No fish or mollusca are found in it. Six large isles, and a multitude of islets and rocks, show themselves just above its surface, being mostly grouped together near its center. The lake is fast drying up, leaving a gradually widening beach of thick saline incrustation, which supplies with salt the whole of Kurdistan. The lake was known in ancient times as *Matiana*, or *Mantiana*.

URUMTSI, a city at the base of the Thian-Shan mountains, in the Chinese province of Urumtsi in central Asia; pop. about 140,000. It was formerly the center of a great trade with the surrounding country, with Russia, Persia, etc. Its commercial importance was ruined by the Dungans, a Mussulman nation in n. China, who revolted in 1862, on account of excessive taxation, and entered s. Mongolia, taking possession of Urumtsi.

U'RUS, a great animal of the ox kind, which anciently inhabited the forests of central Europe, and is described by Cæsar (*Bell. Gall.* vi. 28) as common in the great Hercynian forest; as scarcely less than an elephant in size—an evident exaggeration—but otherwise resembling an ox, of great strength, of great swiftness, and of great fierceness. He mentions that the horns were very different from those of the oxen of Italy—large, spreading, and sharp. This character is found in the wild cattle of Chillingham and other parks in Britain, and in some of the Highland breeds of oxen; and the probability seems to be that the urus was the wild original of the domestic ox, and not a bison, nor any now extinct species, although some authors maintain a contrary opinion. See a monograph by Storer on the *Wild Cattle of Great Britain* (1879).

URVAS'Î. See PURÛRAVAS.

USAGE, in law, is generally employed to denote that long and uniform practice in mercantile transactions or trade, which will be regarded by courts in construing the meaning of contracts. To have such weight the usage must be uniform, certain, reasonable, and not contrary to law; but need not be "immemorial." By the aid of the principles of usage, words and expressions of doubtful meaning may often be explained, but courts are very cautious in accepting the existence of an alleged usage.

USBEGS, or USBEKS, a people of Turkish race, who, at the close of the 15th c. of the Christian era, invaded and conquered the numerous principalities into which Turkistan was at that time divided, and have ever since maintained dominion over the country. At the present day they are for the most part a settled people, occupying themselves in the cultivation of the soil and in trading, and are scattered over Russian, Independent and Chinese Turkistan. The most probable supposition regarding their origin is that they immigrated from Kiptchak (q.v.), and assumed the name of Usbegs, from Usbeg, one of their chiefs. The Usbegs of Khiva, Bokhara, Khokan, and of Chinese Turkistan differ from each other in language, manners, and customs. Those of Khiva speak a dialect of the Turkish, are honest and generous, and destitute of the treachery and duplicity which are so characteristic of oriental civilization, are passionately fond of music and poetry, and though zealous Mohammedans, still retain many of their ancient heathen usages. They pride themselves much on the purity of their Usbeg descent, but most of them show evident traces of an admixture of Iranian blood. The Usbegs of Bokhara have become largely mingled with the Tajiks, and have consequently lost many of their national characteristics. Those of Khokan are very different from the two previous, and are as much Kirghis, Kiptchaks, and Kalmucks as they are Usbegs; the fact that the Usbegs have been the dominant race in Turkistan for three centuries and a half, having given the name such a prestige of nobility and good breeding, that it is generally assumed by such members of other races as settle in cities.

USE AND OCCUPATION is the technical name given in the law of England to the beneficial enjoyment of premises by a tenant, who occupies the real property of another, such as houses and farms. In all cases where a person has had use and occupation of another's premises, with the assent of the owner, an action lies for the value thereof, which value corresponds to rent under an ordinary lease. Hence, where it is doubtful whether there has been a valid lease executed between the parties, the landlord can nevertheless recover rent under the head of use and occupation.

USEDOM, an island belonging to Prussia, lies at the mouth of the Oder, and together with the island of Wollin, shuts off the Stettiner Haff from the Baltic. It is of very

irregular shape, being much indented by branches of the Haff, is 34 m. in extreme length, and 15 m. broad. Area about 148 sq. miles. On its n.e. side is the port of Swinemünde (q. v.); on the s. side is the small town of Usedom.

USES, in the law of England, is the old name for trusts, which has superseded the other in most respects. Uses and trusts correspond to the *fidei commissum* of the Roman law. A use was a confidence reposed in another who was tenant of the land, or *terre-tenant*, that he should dispose of the land according to the intention of the *cestui que use*, or him to whose use it was granted, and suffer him to take the profits. See TRUST.

USH'ANT (Fr. *Ouessant*), an island in the Atlantic ocean, belongs to France, and is included in the dep. of Finisterre, from the w. coast of which it is distant about 20 miles. It is the largest of a small group of islets called the *Iles d'Ouessant*, has an area of 7 sq. m., and contained, '91, 2490 souls. The coasts are escarped and difficult of access; the soil is fertile. The inhabitants are employed in fishing, and in rearing cattle and horses.

USHAS (from the Sanskrit *ush*, "to shine, to burn," and kindred with the Greek *ēōs* or *heōs*, and the Latin *aurora*), "the dawn," is one of the female deities of the Vedic religion of India (see INDIA, sec. *Religion*), and among these is invoked with special predilection by the poets of the R'igveda hymns. The invigorating influence which the dawn exercises on body and mind, and the luminous and other phenomena connected with the beginning of the day, form the subject of some of the best portions of Vedic poetry; and out of them Ushas arises as one of the most pleasing goddesses of the ancient Hindu pantheon. She is invoked as "the affluent," as "the giver of food," and "the bringer of opulence;" she is asked to bestow on the pious "riches with horses and cattle," "posterity and troops of slaves;" and she is praised for the many boons she has showered on the worshipers who were liberal to her. She is the goddess "endowed with an excellent intellect," and the "truthful," or fulfiller of her promises. "She animates the diligent;" when she appears, "bipeds and quadrupeds (are in motion)," "the winged birds flock around from the boundaries of the sky," and "men who have to earn their bread quit their homes." She rides in a "golden chariot," which is "ample and beautiful;" and the Sanskrit word *go* meaning a cow (or, as a masculine, an ox), and also a ray of light, she is not only "the mother of the rays of light," or attended by them, and rays of light are her banner, but her chariot is drawn by "ruddy *kine*," or, as they are sometimes called, "ruddy oxen." Less frequently she is spoken of as traveling with horses; for the horse, as a symbol of light, is more especially appropriated to the god of the sun. The relation of Ushas to other Vedic deities is of a twofold, a physical and a ritual, character, inasmuch as the phenomena of dawn are connected with other phenomena of nature, and as certain religious ceremonies are performed at daybreak. On these grounds, she is frequently addressed as "the daughter of heaven;" and when her "parents" are spoken of, the commentator explains this word as implying "heaven and earth." She is further called the daughter of night (night being the precursor of the dawn); but, on other occasions, she is also spoken of as having night for her sister. She is, besides, the sister of the two luminous deities *Bhaga* and *Varun'a*, and the faithful wife of *Sûrya*, the sun. According to an old commentator (*Yâska*), she would in one passage of the R'igveda also be the deity "who has the sun for her child," "either because the sun is her companion, or because he absorbs the moisture (i.e., the frost);" but as *rus'advatsâ*, the word, so interpreted, admits also of another rendering, it is doubtful whether she bears this epithet, the more so as in another passage the sun is said to follow Ushas as a man follows a woman. The As'wins being the luminous twin-gods, who probably represent the transition from darkness to light, and therefore that intermingling of both which becomes inseparable (see John Muir's "Contribution to a Knowledge of the Vedic Theogony and Mythology," in the *Journal of the Royal Asiatic Society*, new series, vol. ii., 1866), Ushas is called their "friend"—according to Sâyan'a, also their sister; she "follows their luster," and "awakes" them to partake of the soma prepared for them; and in their turn they are asked "to unite with the dawn." Another god, who originally on physical grounds is associated with Ushas, is *Indra* (q.v.), the ruler of the bright firmament. He "generates (i.e., causes to appear) sun and dawn," and "appoints them to their office," which is that of dispelling darkness; but though, "when (in the morning), desiring (the soma), he honors the dawn," his ascendency during the day becomes fatal to her; for then "he slays her," "breaks her chariot;" and "her shattered chariot reposing on (the banks of) the river Vipás', she departs from afar." Most of these deities become, in consequence, associated with Ushas also as sharers in certain sacrifices which are offered to her; and besides these, Agni, the god of fire, who carries the offerings to the gods, and Soma (q.v.). Like many of the most poetical deities of the Vedic creed, also Ushas is excluded from the Hindu pantheon of the classical period. Her place is there taken by *Arun'a* (the ruddy), whom the epic poems and the Purân'as make the son of the patriarch Kas'yapa and his wife Vinatâ, and the younger brother of Garud'a, the bird-vehicle of Vishn'u. According to the *Mahâbhârata*, he was appointed by the gods to the office of charioteer of the sun, in order to intercept his fiery heat, when the sun, angry with the gods for being exposed to the enmity of Râhu (q.v.), it was feared, would consume the world. Where repre-

sented, *Arun'a* is therefore seated before the sun on his chariot, driving his horses; but as the legends deprive him of his legs, his body is seen perfect to his knees only.

USHER, James, Archbishop of Armagh, and by common consent the most learned prelate that ever adorned the Irish Protestant church, belonged to one of the oldest Anglo-Irish families, and was born in Dublin, Jan. 4, 1580. His father, Arnold Usher, one of the clerks in chancery, was a gentleman of good estate, and his uncle, Henry Usher, preceded him in the archbishopric of Armagh. At the age of 13 he entered Dublin college, where his predilection for history soon revealed itself. Having resolved to devote himself to the service of the church, he proceeded, after the solid fashion of the times, to read up the entire literature of ecclesiastical antiquity—a task which occupied him from his 20th to his 38th year! In 1601, he was ordained deacon and priest, and was shortly after appointed preacher of Christ church, Dublin. In 1607, he was chosen to the chair of divinity, a post which he held for 13 years. In 1609, he made one of his numerous visits to England, in the course of which he made the acquaintance of the most distinguished scholars of the age. In 1613, his first publication appeared, entitled *De Ecclesiarum Christianarum Successione et Statu*, which was designed as a continuation of Bishop Jewell's *Apology*. The work was divided into three parts, of which only the first, reaching to the period of Hildebrand, and part of the second, were finished. In 1615, he was appointed, by a convocation of the clergy held at Dublin, to draw up a series of articles (the number amounted to 104) relating to the doctrine and discipline of the Irish Protestant church, in which the doctrines of predestination and reprobation (of which Usher was an unflinching apologist) found prominence. These and other views, such as, that bishops were not a different *order* from presbyters, that the Sabbath should be strictly enforced, that no toleration should be granted to Catholics, laid him open to the charge of Puritanism; but as his loyalty to the principle of monarchy was undoubted, he suffered no diminution of the royal favor; on the contrary, king James promoted him to the bishopric of Meath in 1620; and in 1623, constituted him a privy-councilor of Ireland. Two years later, he was raised to the highest ecclesiastical dignity in the kingdom, the archbishopric of Armagh, and in his official capacity "vigorously" opposed the toleration of popery and the spread of Arminianism. In 1632, Usher published *Veterum Epistolarum Hibernicarum Sylloge*, a collection of letters out of several ancient MSS., concerning the state of the Irish church from 592 to 1180; in 1638, *Emmanuel, or a Treatise on the Incarnation of the Son of God;* in 1639, *Britannicarum Ecclesiarum Antiquitates*, which is said to contain "a most exact account of the British church; from the first planting of Christianity, twenty years after our Saviour's crucifixion, down, both in Britain and Ireland, to the end of the 7th c.;" in 1641, *The Judgment of Dr. Reynolds concerning the Original of Episcopacy defended; The Original of Bishops; The Power of the Prince and the Obedience of the Subject*, etc. When the civil war broke out, Usher, who was in England at the time, espoused the side of the king, refused to sit, when nominated, among the assembly of divines at Westminster, and made himself very obnoxious to the parliament by the sermons which he preached at Oxford. When the fortunes of the king began to decline, Usher left Oxford; his property and revenues in Ireland were seized, and after a residence in Wales and elsewhere, he came to London in 1647, where, in spite of his royalist sympathies, he was chosen by the benchers preacher of Lincoln's Inn, a post which he retained till his death, March 21, 1656. Cromwell, who had a great respect for his learning, ordered his remains to be interred with great magnificence in Erasmus's chapel in Westminster abbey. Usher was a man of undoubted ability and of enormous erudition, pious and free from worldly ambition; but he lacked force of character, real insight and intellectual power, hence, though pronounced by Dr. Johnson "the greatest luminary of the Irish church," he exercised less influence over the course of contemporary events than the humblest of Cromwell's Ironsides. Nor can it be shown that posterity is very deeply indebted to him for more than the example of a virtuous and studious life. Usher's chief works, besides those already mentioned, are his edition (1644) of the *Epistolæ* of Polycarp and Ignatius; his treatise *De Romanæ Ecclesiæ Symbolo* (1647); *Dissertatio de Macedonum et Asianorum Anno Solari* (1648); and *Annals of the Old Testament* (1650–54), a chronological work. After his death, there were published (from his numerous MSS.), *Chronologia Sacra*, etc. (Oxford, 1660), by which and his *Annals* he is most widely known; a volume of *Sermons; Historia Dogmatica Controversiæ inter Orthodoxos et Pontificios de Scripturis et Sacris Vernaculis* (Lond. 1690); *A Collection of three hundred Letters written to James Usher, Lord Archbishop of Armagh*, to which is prefixed a life of the archbishop by his chaplain, Richard Parr, D.D, (Lond. 1686). A collected edition of Usher's works, in 16 vols., with a new biography, was published at Dublin in 1841, by Dr. Elrington.

USHER of the **BLACK ROD**, one of the officers of the Order of the Garter (q.v.), coeval with the institution of the order, and originally called "Hostiarius capellæ regis infra castrum de Windsor." The rod from which his title is derived is of ebony, mounted with gold 3½ ft. in length, having at the top a lion sejant, holding before him in his forepaws a gold shield charged with the royal cipher in gold surrounded with the garter. He has a mantle like that of Garter King of Arms, and his badge is a gold knot surrounded with the garter, and ensigned with the royal crown. It is the practice to unite this office with that of the king's first gentleman usher daily waiter at court, who is one of the

chief officers of the house of lords. In this capacity it is one of the functions of the Gentleman Usher of the Black Rod, or of his deputy, who is known as the Yeoman Usher of the Black Rod, to desire the attendance of the commons in the house of lords when the royal assent is to be given to bills by the sovereign or lords commissioners; also to execute orders of commitment for breach of privilege and contempt, and to assist at the introduction of peers, and other ceremonies of the upper house.

USHER OF THE **GREEN ROD**, one of the officers of the Order of the Thistle (q.v.), whose duties consist in attendance on the sovereign and knights when assembled in chapter, and at other solemnities of the order. The rod from which the title is taken is of green enamel, three feet in length, ornamented with gold, having on the top a unicorn of silver, holding before him an escutcheon charged with the cross of St. Andrew.

USKUP, or SCO'PIA, a t. of European Turkey, capital of the vilayet of Kasavo, on the Vardar, 120 m. n.w. of Salonica. The town, which is built on hilly ground, contains a number of mosques, with black domes and minarets, interspersed among fruit trees. Here are the ruins of an ancient Roman aqueduct, consisting of 55 arches. Leather is manufactured. Pop. estimated at 28,000.

USNEA, a genus of lichens, having a much-branched thallus, with an elastic thread in the center. Some of the species are natives of America. They grow on trees, and are generally pendulous. They contain the vegetable principle called *usnine*, which, however, is also found in many other lichens. They are sometimes used in dyeing, like archil and cudbear. From their appearance, many of the species of usnea receive the popular name of BEARD-MOSS. See illus., MOSSES, ETC., vol. X.

USTILA'GO. See SMUT.

U'SUFRUCT, in Scotch law, is adopted from the Roman law, to denominate one of the three personal servitudes, which were use, usufruct, and habitation. Usufruct is better known under the name of life-rent (q.v.), or estate (q.v.) for life.

USURY. See INTEREST.

UTAH, a western state of the U S., between lat. 37° and 42° 10′ n. ; long. 109° and 114° w. ; bounded on the n. by Idaho and Wyoming; on the e. by Wyoming and Colorado ; on the s. by Arizona, and on the w. by Nevada ; average length from n. to s., 350 m. ; average breadth, 260 m. ; land area, 82,190 sq.m. ; gross area, 84,970 sq.m., or 54,380,800 acres.

HISTORY.—The state, which derives its name from the Utah or Ute Indian tribe, was originally a part of Upper California; was acquired by the U. S. from Mexico by treaty in 1848; and was first explored by the Spaniards about 1540. The Mormons, driven from Illinois and Missouri, emigrated hither in 1847–48, and established themselves in what was then almost an unknown region, which they named Deseret. Under the superintendence of their high-priest, Brigham Young, Salt Lake City was soon founded; in March, 1849, a convention was held and the state of "Deseret" organized. Admission was refused by congress, and in 1850, Sept. 9, a territorial government was formed, over which Young was appointed governor. The territory at that period included parts of Colorado, Nevada, and Wyoming, and had an area of more than 220,000 sq. m. In 1857, however, Young set at defiance the federal authority, and it became necessary for the U. S. government to send an armed force into the territory to compel obedience. In 1862 the Mormons formed a state constitution, and demanded admission to the union as the "state of Deseret." The refusal caused further unpleasant relations. The opening of mines in the territory brought about the emigration of many "Gentiles" to Salt Lake City and the surrounding region, which to some extent worked a change in Mormon authority. The enforcement of the "Edmunds bill" (see MORMONS), which was passed by congress in 1882, providing for the suppression of polygamy, and disfranchising polygamous Mormons, met with stubborn resistance, and was followed by a bill in 1887 restricting the suffrage and escheating a vast amount of Mormon property, real and personal. This led the Mormons in 1890 to pledge themselves to discontinue the practice of polygamy. In 1886 the Mormons made another futile attempt to secure statehood; but it was not till after their full agreement to obey the laws of congress that that body sanctioned admission as a state, which was accomplished Jan. 4, 1896.

TOPOGRAPHY.—Utah is an immense basin 4000–5000 ft. above the level of the sea, surrounded by mountains, which at some points reach the altitude of 8000–13,000 ft. The Wasatch range, about 12,000 ft. in altitude, crossing from n.e. to s.w., divides it into two portions. Another important range, the Uintah Mts., lies near the Wyoming border, and to the w. of the Wasatch chain are numerous peaks, ridges, and isolated hills. In the s.e. lofty plateaus of great extent are found. Excepting the Green and Grand rivers in the e. and s.e., which unite to form the Colorado, and their tributaries, the streams as a rule flow into the Great Salt lake in the n.w. part of the state, or similar inland bodies of salt water. Great Salt lake (q. v.) is about 80 m. long and from 30 to 50 broad. Its area is 3000 sq. m. and its waters are 22 per cent. salt. Utah lake (q. v.) has an area of 130 sq. m., and is connected by the Jordan river with Great Salt lake. Sevier lake, another large sheet of water, has no outlet, but receives from the N. Sevier river, 150 m. in length. A portion of the great cañon of the Colorado is in Utah. Salt and thermal springs are numerous.

GEOLOGY AND MINERALOGY.—The rocks are mostly primitive, and rich in granite, jasper, syenite, porphyry, and quartzes, showing everywhere evidences of volcanic action.

AREA AND POPULATION OF UTAH AND COLORADO BY COUNTIES.

(ELEVENTH CENSUS: 1890.)

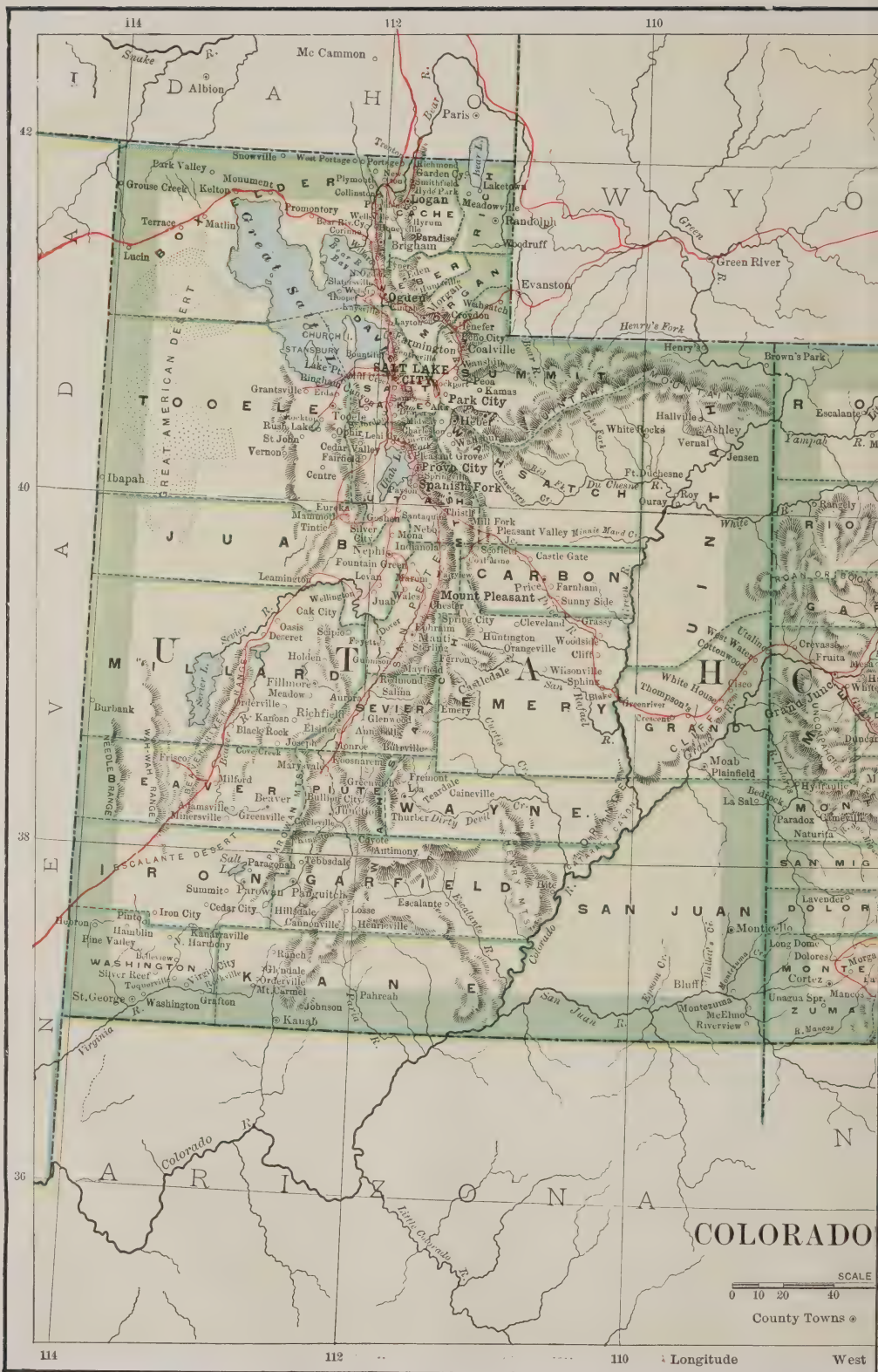
UTAH.

	Area in Square Miles.	Population.		Area in Square Miles.	Population.
Beaver	2,704	3,340	Salt Lake	784	58,457
Box Elder	7,016	7,642	San Juan	9,178	365
Cache	1,090	15,509	Sanpete	1,784	13,146
*Carbon	.....	.....	Sevier	1,872	6,199
Davis	290	6,751	Summit	3,062	7,733
Emery	5,723	5,076	Tooele	6,240	3,700
Garfield	1,364	2,457	Uintah	5,834	2,762
Grand	3,175	541	Utah	1,986	23,768
Iron	3,436	2,683	Wasatch	3,444	3,595
Juab	3,828	5,582	Washington	2,446	4,009
Kane	4,172	1,685	*Wayne	....	.....
Millard	6,712	4,033	Weber	650	22,723
Morgan	725	1,780			
Pi Ute	3,695	2,842	Total	82,190	207,905
Rich	980	1,527			

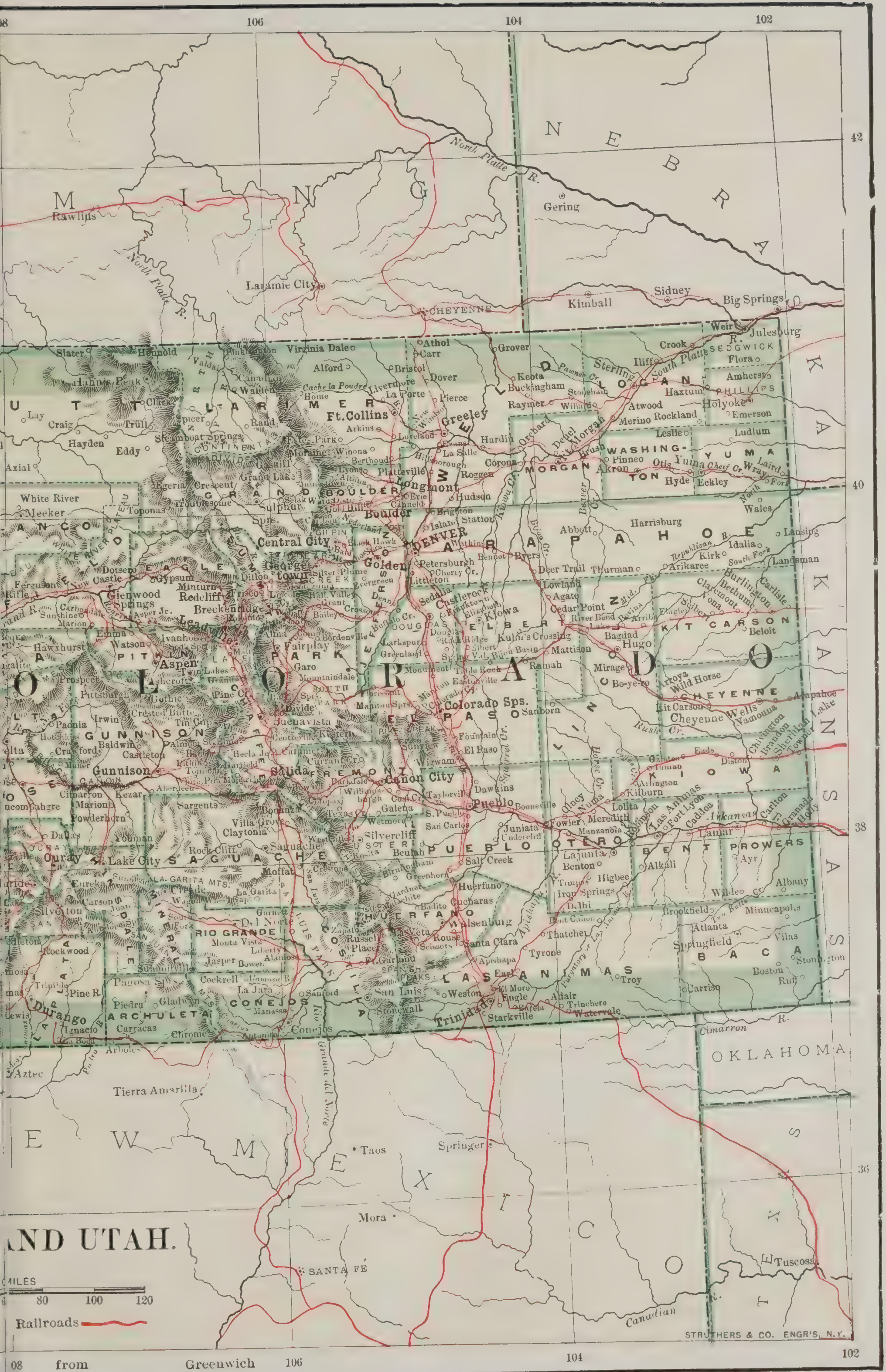
COLORADO.

	Area in Square Miles.	Population.		Area in Square Miles.	Population.
Arapahoe	5,220	132,135	Larimer	4,100	9,712
Archuleta	1,100	826	Las Animas	4,700	17,208
Baca	2,300	1,479	Lincoln	2,600	689
Bent	1,500	1 313	Logan	1,830	3,070
Boulder	790	14,082	Mesa	3,000	4,260
Chaffee	1,150	6,612	*Mineral	.....	.....
Cheyenne	1,800	534	Montezuma	2,640	1,529
Clear Creek	390	7,184	Montrose	2,300	3,980
Conejos	1,200	7,193	Morgan	1,290	1,601
Costilla	1,720	3,491	Otero	2,050	4,192
Custer	720	2,970	Ouray	450	6,510
Delta	1,150	2,534	Park	2,100	3,548
Dolores	1,000	1,498	Phillips	570	2,642
Douglas	840	3,006	Pitkin	950	8,929
Eagle	1,600	3,725	Prowers	1,650	1,969
Elbert	1,880	1,856	Pueblo	2,400	31,491
El Paso	2,660	21,239	Rio Blanco	3,600	1,200
Fremont	1,600	9,156	Rio Grande	1,260	3,451
Garfield	3,250	4,478	Routt	6,000	2,369
Gilpin	150	5,867	Saguache	3,240	3,313
Grand	2,100	604	San Juan	500	1,572
Gunnison	3,200	4,359	San Miguel	1,300	2,909
Hinsdale	1,400	862	Sedgwick	650	1,293
Huerfano	1,600	6,882	Summit	690	1,906
Jefferson	860	8,450	Washington	1,080	2,301
Kiowa	1,800	1,243	Weld	4,075	11,736
Kit Carson	2,150	2,472	Yuma	1,180	2,596
Lake	450	14,663			
La Plata	1,860	5,509	Total	103,645	412,198

* Organized since 1890.



INTERNATIONAL CYCLOPÆDIA



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There are also ridges of carboniferous limestone containing calcareous spar; and near Salt Lake City occur boulders of serpentine, fine gray granite, sandstones, conglomerates, talcose and striated slates, gypsum, limestone, and marble of every hue in large masses. Gold, silver, and lead ores exist in large quantities, and iron ores of all rich qualities are very abundant. In Iron co. there are rich deposits of hematite and magnetite. Other deposits of large extent have also been found in the Castle valley region and in the n. part of the state. There are great quantities of bituminous coal, also copper, zinc, sulphur, alums, rock salt, asphaltum, borax, and petroleum.

Zoölogy and Botany.—The antelope, black-tailed deer, Rocky Mountain sheep, wolf, panther, grizzly bear, beaver, fox, and porcupine are found, over 170 species of birds, and the swan, pelican, goose, quail, grouse, etc. Perch, bass, pike, and large salmon trout are taken in the rivers or lakes. Generally, vegetation is not luxuriant, and timber, except pines and firs in the mountains, scarce. The country has good grass for grazing, and some wild fruits.

Soil, Climate, and Agriculture.—The soil of the lowlands is somewhat alkaline, extremely sandy in portions, and very dry. Much of it, however, has been reclaimed by irrigation and rendered profitably productive. The precipitation of rain on the highlands is sufficient for vegetation. The mean annual temperature in spring is 46.20°; in summer, 73.57°; in winter, 30.38°; the average annual rainfall is 15.10 inches. Agriculture and mining are the principal industries, the chief localities of the former being the valleys of Sanpete, Weber, Salt Lake, Jordan, Tooele, Malade, Rush, Sevier, and Rio Virgin. The mountains and high valleys produce an abundance of nutritious grasses, in consequence of which a large live-stock industry has been developed. In 1890 the farm acreage was 1,323,705, and the value of farms, with buildings and fences, was reported at $28,402,780, or more than double that of 1880, an improvement attributable in large measure to extensive irrigation. The principal cereal productions are wheat (nearly 3,000,000 bushels), oats (nearly 1,000,000 bushels), corn, barley, and rye. The potato crop exceeds 800,000 bushels, and the hay crop is about 500,000 tons. The total value of the crops enumerated is over $5,000,000. The farm and ranch animals exceed $10,500,000 in value, and the most numerous are sheep (about 2,000,000), cattle (over 400,000), and horses.

Manufactures and Mining.—In 1890 there were 531 manufacturing establishments, with an aggregate capital of $6,583,022, and employing 4980 hands. The wages paid amounted to $2,715,805, and the value of products was $8,911,047. The chief manufactures are flour and grist mill products, planing mill products, packed meat, brick and tile, woolen goods, foundry and machine shop products, lumber mill products, salt, malt liquors, and cigars. Mining in Utah has become exceedingly profitable. Rich carbonate strikes have been made at Eureka, 90 miles south of Salt Lake City, and the onyx vein on the west shore of Utah lake is said to be one of the most valuable in the world. The mines of Utah, however, are not always worked to the greatest advantage. Between 1871 and 1891 the total product was valued at $150,000,000, two-thirds of which was in silver, a little less than one-third in lead, and the balance in gold, copper, mixed antimony, cinnabar, and sulphur. The total value of the mineral productions in 1896 was estimated at $15,897,266, of which silver, gold, unrefined lead, and copper were the most important. This was a slight increase over the total of the previous year, when the silver output had a coining value of over $9,500,000, and the gold over $1,350,000. The production of silver in 1897 was estimated at 8,100,000 fine ounces, an increase of over 600,000 ounces in a year, and of gold, 97,906 fine ounces, an increase of about 31,500 ounces. There are a number of natural gas and oil wells near Salt Lake City.

Transportation.—The state is crossed by branches of the Union and Southern Pacific railroads, and has over 1400 miles of through and local roads. The latter have a capital of about $20,000,000; funded debt, nearly as large; total investment $40,000,000; and net earnings, over $750,000. The cost of local roads and equipments exceeds $35,500,000.

Banks.—On Oct. 31, 1896, there were 11 national banks in operation, with capital $1,900,000, deposits $2,624,924, and reserve $1,013,096; 9 state banks, with capital $1,165,000, deposits $924,710, and resources $2,456,627; and 8 stock savings banks, with capital $800,000, deposits $2,655,356, and resources $3,874,155.

Religious Denominations, Education, etc.—In 1890 there were reported 427 church organizations; 280 church edifices; 157 halls used for religious purposes; 128,115 communicants; and church property valued at $1,493,791. The church of Jesus Christ of Latter-day Saints (Mormon) had 192 church buildings, 118,201 members, and property valued at $736,916. The completion of the great temple at Salt Lake City (q.v.) in 1893 increased the value of Mormon church property by several millions. Other denominations, in their order, are the Roman Catholic, Methodist Episcopal, Protestant Episcopal, Presbyterian, and Congregational. The state constitution provides that the public school system shall include kindergarten schools, common schools of primary and grammar grades, high schools, a state university, a state agricultural college, and such other schools as the legislature may establish. The state institutions include a university at Salt Lake City, agricultural college at Logan, state school for the deaf and dumb

and blind at Ogden, and state industrial school at Ogden. The public school population exceeds 86,000; enrollment, 62,000; average daily attendance, 40,000; school houses, 900; value of school property, $2,350,000; annual expenditure, $900,000.

GOVERNMENT. — The state constitution decrees the complete separation of church and state; guarantees perfect toleration in matters of religion; gives to women the rights to vote and hold office; condemns polygamy; and provides that eight jurors may sit in judgment, and six may find a verdict. The legislature meets in biennial sessions, limited to 60 days; members receive not more than $4 per day and mileage limited to ten cents a mile. The executive department consists of a governor, secretary of state, auditor, treasurer, attorney-general, and superintendent of public instruction, each to hold office for four years. The supreme court consists of 3 judges till 1905, when the number may be increased to 5; terms, after the first, 6 years each. The governor, justices of the supreme court, and attorney-general constitute a board of pardons; the governor, secretary of state, and attorney-general, a board of state prison commissioners; the governor, treasurer, and auditor, a board of insane asylum commissioners; and the governor, attorney-general, and superintendent of public instruction, a board of reform school commissioners. For immediate needs the state was divided into 7 judicial, 27 representative, and 12 senatorial districts.

POPULATION. — In 1850, 11,380; 1860, 40,273; 1870, 86,786 (excluding Indians); 1880, 143,963 — 501 Chinese, 807 civilized Indians; foreign born, 43,994; male, 74,509; female, 69,454; dwellings, 26,710; families, 28,373; persons to sq. m., 1.7; territorial population, 1890, 207,905. There are 27 cos.; for pop. 1890, see Census Tables, XV. In 1890 the principal cities and towns, with their population, were, Salt Lake City, 44,843; Ogden, 14,889; Provo City, 5159; Logan, 4565; Park City, 2850; Springville, 2849; Mount Pleasant, 2254; Spanish Fork, 2214; Brigham City, 2139; Payson, 2135; and Nephi, 2034. The civilized Indians in the state number about 600.

UTAH, a co. in central Utah, bounded on the n. by Salt Lake co., and containing a portion of the Wasatch range; also Utah lake. The Southern Pacific and the Rio Grande Western railroads intersect, 1986 sq. m.; pop. 1890, 23,768, chiefly of American birth. Co. seat, Provo City.

UTAH LAKE, in Utah co., Utah, 4499 ft. above the level of the sea; 130 sq. m.; 25 m. long, 13 m. wide. It is a body of fresh water without islands, having the Wasatch mts. on the e., the Oquirrh range 10 m. distant, and the Lake and Tintic mts. on the w. Its tributaries flow from the e. It is fed by Corn creek, Hobble creek, the American fork, the Spanish fork, and Provo river. It has an outlet at the n. extremity by the river Jordan, 40 m. in length. It abounds in water-fowl and various kinds of fish.

UTAHS, or UTES, a tribe of American Indians living in Utah, Nevada, Colorado, and New Mexico. They belong to the Shoshone family. Those bands living in Utah were originally friendly to the Mormons, but afterward became hostile. The most important bands are the Yampa, Mohuache, and Capote in New Mexico and Colorado, and the Uintah, Sanpitches, and Pahvants in Utah. The Capotes made a treaty in 1855. The Mohuaches would not help the Mormons fight the United States. In 1865 some of the bands made cession of large tracts of land, agreeing to go on reservations. Black Hawk, chief of the Pah-Utes, fought against the whites, aided by Sanpitch, chief of the Sanpitches, who was arrested, and afterward killed. In 1866 the Mohuaches were defeated by col. Alexander. Rich mineral deposits were afterward found on the Ute reservation in Colorado, and, in accordance with an act of congress in 1872, the reservation Indians ceded 4,000,000 acres.

U'TERUS. See WOMB.

UTES. See PI-UTES.

UTICA, city and co. seat of Oneida co., N. Y.; on the Mohawk river, the Erie canal, and the Delaware, Lackawanna, and Western, the New York Central and Hudson River, the New York, Ontario, and Western, the Rome, Watertown, and Ogdensburg, the Unadilla Valley, and the West Shore railroads; 52 miles e. of Syracuse. The city is built on ground rising from the river to a height of from 410 to 523 feet above sea level; is regularly and handsomely laid out; and has more than a dozen public parks and squares. It is lighted exclusively by electricity, and has several electric street railroads, waterworks belonging to a private corporation, and excellent drainage. Among the noteworthy buildings and institutions are a U. S. government building, state, city, St. Luke's, Homœopathic, and Faxton hospitals, Masonic home, St. Vincent's protectory, orphan asylum, home for the aged, home for the homeless, Y. M. C. A. building, state armory, public library, Oneida co. historical society, young ladies' seminary, academy of the Assumption, conservatory of music, school of music, business colleges, Forest Hill cemetery, and about 50 churches. In 1890 the U. S. census reported for Utica, 565 manufacturing establishments, employing $14,332,510 capital and 12,598 persons. The principal manufactures are men's clothing, cotton goods, boots and shoes, foundry and machine shop products, hosiery and knit goods, cigars, flour and grist mill products, and steam fittings and heat-

ing apparatus. Utica is the center of a noted dairying and hop-growing region, and is one of the largest cheese markets in the United States. There are national, state, and savings banks, and numerous daily, weekly, and monthly periodicals. The city occupies the site of Fort Schuyler, erected at the fording-place of the river about 1758; was settled by colonists from England, and New England after the revolutionary war; was incorporated as a village in 1798; and received a city charter in 1832. Pop. '90, 44,007.

UTICA, an ancient city of Africa, near the bay of Carthage, and a little n.w. of the site now occupied by Tunis. Tradition gives the date of its founding by the Tyrians as 287 years before that of Carthage, of which it was an ally against Rome; but in the third Punic war, Utica, by early submission to Rome, obtained the grant of part of Carthage's territory. The city became prominent during the civil war, for, after the death of Pompey, Cato marched his army there and joined the force under Scipio, Pompey's father-in-law. When Cæsar won the battle of Thapsus, Cato who had remained at Utica tried to reunite the fragments of the defeated army, but, failing in this, gave up all hope of resistance and killed himself. From the circumstance of his death he was surnamed Uticensis. Utica became a free city under Cæsar and it received further concessions from Augustus, but the capital was transferred to Carthage, which was rebuilt and extended by Cæsar and his successor. It was destroyed by the Arabs toward the end of the 7th century. Its ruins lie west of the river known to the ancients as Bagradas. The site of the city was anciently on the shore of the northern part of the Carthaginian gulf and about 27 Roman miles n.w. of Carthage, but on account of changes in the coast-line, caused by the river Bagradas, its site is at present inland.

UTILITA'RIANISM, the name of the peculiar theory of ethics, or of the ground of moral obligation, that adopts, as the criterion of right, the happiness of mankind. The word "utility" was employed, in this acceptation, by Jeremy Bentham; the form "utilitarianism" was first used by John Stuart Mill.

The doctrine of utility is opposed to all those theories that refer us to some internal sense, feeling, or sentiment, for the test of right and wrong; a test usually described by such phrases as a moral sense, and innate moral distinctions. See Ethics. Whence utility is sometimes termed the *external* or objective standard of morality. It is also opposed to the view that founds moral distinctions on the mere arbitrary will of God.

The utilitarian theory has been maintained both in ancient and in modern times, although with considerable variation, not merely in the mode of stating it, but in important peculiarities. Thus, in ancient times, it was held by Epicurus, but in a purely self-regarding form; each person's end was his own happiness exclusively, the happiness of others being instrumental and subordinate. The modern phase of the theory may be said to begin with Hume. He employed, as the leading term of his system, not utility, but benevolence; whereby he gave especial prominence to the disinterested side of moral actions. He strenuously maintained, what must be regarded as the essential feature of the utilitarian doctrine, that no conduct is to be deemed worthy of moral approbation unless, in some way or other, it promotes human happiness; and that actions ought to be visited with disapprobation, exactly according as they have the opposite tendency.

Jeremy Bentham is, more than any other person, identified with the theory of utility, which was, in his hands, not merely the foundation of ethics, but also the basis and justification of political and legal reforms. Having in view the state necessity of sacrificing smaller interests to greater, or, at all events, of not sacrificing greater interests to smaller, he described the ethical end as "the greatest happiness of the greatest number." He illustrated the doctrine by setting it in opposition to *asceticism*, which he interpreted to mean, that pleasure is forfeited, and pain incurred, without yielding a compensating amount of good, either to the agent or to other persons.

Paley advocated a form of utility. He made the will of the Deity, enforced by future rewards and punishments, the impelling motive to duty; but in determining what that will was, in particular cases, he included a reference to the beneficial tendency of actions.

James Mill maintained substantially the views of Bentham. Sir James Mackintosh, while differing in some points from Bentham and from Mill, in the main adhered to utility as the ultimate standard of right. John Austin, in his *Province of Jurisprudence Determined*, has contributed a lucid exposition and a powerful defense of the principle. John Stuart Mill has devoted a separate work to the subject. Samuel Bailey, in his *Letters on the Human Mind*, vol. iii., has discussed the ethical problem fully, and pronounced upon the utilitarian side. Herbert Spencer ranks among the upholders of the theory; and likewise Bain, in his edition of Paley (Chambers's series), and in *The Emotions and the Will*.

Before stating the arguments for and against the principle of utility as the basis of morals, it is proper to inquire what sort of proof an ethical system is susceptible of. Ethics is a practical science (see Sciences), and, as such, involves an end; having the peculiarity of being the final or comprehensive end of all human conduct. See Teleology. Now, in the speculative or theoretical sciences, *ultimate* principles cannot be proved; it is the nature of proof to rest one doctrine on some other doctrine, so that we

must come at last to what is taken without proof; we cannot prove our present sensations; nor can we demonstrate that what has been will be; we must take these things for granted. And so it is with ultimate ends in the practical sciences: we cannot prove that each person should seek his own happiness; we must assume it as an ultimate fact, and trace the consequences. The final end of all conduct cannot be reasoned; it must be gathered from the actual conduct of men; we must find by observation what ends men actually pursue, and, if we can, generalize them into one comprehensive statement. The function of argument in the case is to show where inconsistency has crept in, or to make professions accord with practice. Thus it is that the supporters of utility aver that men, even although refusing the theory, still proceed upon it in their conduct; and that the doctrine cannot be impugned consistently with the admitted motives of human action. Human beings, as a rule, have no other end in life but happiness, either for themselves or for others; and morality belies human nature if it does not accord with this universal object of pursuit.

Although utilitarians hold that good and evil, right and wrong, are properly determined by a calculation of the consequences as regards human happiness, they do not all maintain that past or existing systems of morals have been on all points framed on this principle. Bentham and James Mill appear to have thought that the rule has always been kept in view, though often badly applied. But others, equally earnest in regarding it as the only legitimate rule, are of opinion that, in the past and existing ethical precepts, men have been guided partly by utility, and partly by sentiment—that is, liking or disliking for the act itself, irrespective of any further consequences. Thus, the veneration of the Hindu for the cow, on which ethical duties are founded, is an instance of sentimental liking; the Jewish or Mohammedan prohibition of the pig is a matter of sentimental dislike. In the ceremonial rights of ablution, so widely prevalent, there is a certain show of utility, mixed up with the fancy of cleanliness or purity. In the doctrine of the sacredness of kings, there is a combination of utility and sentiment.

The following are the chief objections to the utilitarian scheme, with the arguments in reply :

I. It is maintained that happiness is not, either in fact or in right, the sole aim of human pursuit; that men actually, deliberately, and by conscientious preference, seek other ends. For example, virtue is an end in itself, to be sought whether it yield happiness or not, and even if it should be productive of the greatest misery. The qualification, however, is always added, that virtue, in the long run, without intending it, and all the more for not intending it, is the unfailing source of happiness.

To which the supporter of utility answers:

1. It is quite true that men seek other ends than immediate happiness to themselves and to others, and that, in particular, they cultivate the virtues as ends in themselves, without always thinking of them as means to happiness. But, then, this is by the operation of a familiar law of the mind, whereby what was originally of the nature of means comes at length to be valued as an end; such is the well-known case of the love of money. The virtues of justice and veracity are essential to human society, just as money represents the basis of subsistence; and by frequent association, the regard that we pay to the end is transferred at last to the means.

2. It may be shown in many ways that the great social virtues derive their worth, in our estimation, from their subservience to human happiness, and not by any absolute title of their own. Take, first, veracity or truth, which, of all the moral duties, has most the appearance of being an absolute and independent requirement. A little consideration will show that even this is not, in our eyes, an unlimited or unqualified virtue. Men have always approved of deception practiced toward an enemy in war, to a madman, or a highway robber; also secrecy or concealment, even although misinterpreted by others, is generally allowed—unless it leads to some pernicious results; while, if the divulgence of truth were attended with harm, it would be universally reprobated. But an absolute standard of truth is incompatible even with secrecy or disguise; in departing from the course of perfect openness, or absolute publicity of thought and action, in every possible circumstance, we renounce ideal truth in favor of a compromised, qualified veracity—a following of truth only so far as is expedient.

Again, as regards justice, the presence of considerations of utility is equally obvious. There is no absolute rule of justice that does not bend to circumstances. If justice be defined, giving every one his own or what he is entitled to, there is the show of an absolute rule; but, in reality, nothing is determined. The meaning is to give to each what *law* and *custom* have declared to be a man's own. It is declared just for an elder son to receive a larger share of the parental estate than all the rest of the children put together; but it is clear that whatever justice there is in this must be founded on some ground of expediency. (See on this subject, J. S. Mill's *Utilitarianism*, chap. v.)

II. It is further objected to the adoption of utility as the standard of right, that the full consequences of actions are too numerous, involved, and complicated to be reduced to calculation; and that even where the calculation is possible, people have seldom time to make it.

To this it is answered, first, that the primary moral duties refer to conduct that can be fully calculated to the satisfaction of any reasoning mind. Thus, to revert to the

two leading examples, truth and justice: the habitual disregard of these duties would soon bring a society to utter confusion and ruin; without them there could be no social co-operation; man would fall below the condition of the gregarious animals; the race could hardly be saved from extirpation. On the other hand, the observance of these duties, in a high degree, raises to a corresponding degree the means of human happiness. The balance of advantages is all on one side—there is no case for the other side at all.

There have always been moral rules or enactments where the calculation of consequences was much less easy; for example, the indissolubility of marriage is maintained in some countries and not in others; and there have been considerable differences as to the forbidden degrees of affinity in marriage. In these usages there are both advantages and disadvantages, and the preponderance is variously estimated by different calculators. In such cases the utilitarian would say: Do not make a compulsory enactment restricting liberty, which restriction is an evil in itself, unless the balance of advantages is unquestionable and great.

As to the argument that it is impossible to make the calculation of consequences every time we perform a moral act, the reply is, this is unnecessary; the calculations as to the various duties have been already made, and are embodied in rules, which rules we remember and apply without thinking of the process gone through in arriving at them. The navigator at sea does not need to compute the *Nautical Almanac* every time he determines his longitude; he carries it to sea with him ready for use.

III. A third objection is that men in all ages have distinguished between the right and the expedient, that is, the useful; the two are in most languages put in opposition or contrast. The reply is that the expedient, when thus opposed to the right, commonly means what is expedient for the agent at the time, but is not expedient for people generally, or even for himself in the long run. It is sometimes expedient, in this sense, to tell a lie, to rob, or to murder; but such actions are not expedient in the sense of general utility, or the greatest happiness of mankind.

It is further to be remarked in this contrast of the expedient and the right, that the expedient may mean simply an addition to our conveniences or comforts, something that it is well for us to have, but that we might do without. Thus it is highly expedient to possess cheap postage, railways, and electric telegraphs. On the other hand, the right points to the essentials of our existence; without the fulfillment of contracts, respect to life and property, obedience to law, society would be dissolved. The distinction was expressed in one of Cromwell's speeches, by the contrast of a nation's being and its well-being; what secures the one is emphatically the right, the promotion of the other is the expedient. Right is the highest and most imperative form of expediency.

IV. A fourth objection against the utilitarian scheme is that all useful things are not made obligatory; it may be useful to have railways, but it is not a duty of every man to make them. But the utilitarian, while contending that nothing should be made a moral duty but what contributes to the happiness of mankind, does not hold the converse, that whatever promotes human welfare is a moral duty.

So much for the objections. The positive ground of utilitarianism is that men actually recognize happiness as their paramount consideration, or highest end. This, as a general rule, is too obvious to require proof. Each one's plan of life is principally made up of ideas of happiness to self or to others. All our good wishes to one another are repetitions of the one idea, "May you be happy." The seeming exceptions have been noticed above.

One of the strongest confirmations of the doctrine is derived from the usual inducements to right conduct, common to all moralists. We find that no one can preach morality without making use of its bearings upon happiness. The very meaning of the terms expressive of the highest virtues—love, goodness, mercy, compassion, fidelity, honesty, integrity, justice—is something that relieves the pains and augments the pleasures of sentient beings. To love is to make the object happier, and love is the fulfilling of the law.

Although there be duties occasionally imposed upon men that have no obvious tendency to increase happiness, but rather to diminish it, as the labors of some cumbrous ceremonial system like Hinduism, those duties have to be upheld by the fear of punishment or the hope of reward, still testifying to the predominating motives of the human mind. It is not, however, by reference to traditional observances that the happiness motive is most clearly tested. The proper plan, as remarked by Mr, Samuel Bailey, is to try it upon some fresh case, some entirely new enactment, when it will be found that the interest or happiness of the community is the *sole* consideration appealed to. If a new law of inheritance is proposed, or a new government board constituted, nobody advances any other criterion but expediency, or the good of certain persons now or in the future; unless such expediency can be shown, no one will move in the matter at all; and the earnestness of the promoters will be in exact proportion to their sense of the resulting good. We may, through blind conservation, keep up usages not only destitute of utility, but productive of harm; but we should not now deliberately set up for the first time any practice that we did not regard as conducive to somebody's well-being. Traditional associations excepted, the strength of our approbation or disapprobation always follows our estimate of happiness or misery produced.

It is worthy of remark that utility, or the promotion of human welfare, as it is the very meaning of the work of a public benefactor, expresses the sum of the labors of all the best men that have ever lived.

UTO'PIA (Gr., *ou*, not; and *topos*, a place, equivalent, therefore, to "Nowhere") is the name given by Sir Thomas More (q.v.) to the imaginary island which he makes the scene of his famous political romance, *De Optimo Respublicæ Statu, deque Nova Insula Utopia* originally published in Latin, at Louvain, in 1516, and translated into English by Bishop Burnet. This island, which More represents as having been discovered by a companion of Amerigo Vespucci, is the abode of a happy society, which, in virtue of its wise organization and legislation, is free from the harassing cares, inordinate desires, and customary miseries of mankind. More's romance obtained a wide popularity, and the epithet *utopian* has since been applied to all schemes for the improvement of society which are deemed not practicable—e.g., to those of St. Simon (q.v.) and Fourier (q.v.). Everything, however, is not utopian that is called such. All the great changes that have taken place in the world have had to pass through a "utopian" phase.

U'TRAQUISTS (Lat. *utraquistæ*, from *utrâque*—i.e., *specie*, in both kinds), a name at first given to all those members of the western church, in the 14th c., principally followers of John Huss, who contended for the administration of the eucharist to the laity under both kinds; but in later times restricted to one particular section of the Hussites, although all the members of that sect alike claimed this as a fundamental principle of their church discipline. The name may be said to date from 1415, when the followers of John Huss, in Prague, and elsewhere in Bohemia, adopted "The communion of the cup" as their rallying cry, and emblazoned the cup upon their standards, as the distinguishing badge of the association. In 1417 the university of Prague, by a formal decision, directed that all the laity should communicate in both kinds; and the council of Constance, in consequence, prohibited students from any longer resorting to Prague for the purposes of study. The Hussite party, on the contrary, made the demand one (the second) of the four points upon which they insisted as the condition of their submission to the church. Their demands were rejected by the council of Constance; but the council of Basel, in 1433, acceded to the demand for the cup, under the condition that, whenever communion was so administered, the ministering priest should accompany the ministration with a declaration that Christ was contained whole and entire under each species. A portion of the Hussite party was content with the explanation of this and the other points offered by the council, but the more violent held out. See Huss. The former were called Utraquists, and continued to be so designated. During the reformation troubles, this division was still maintained. The Utraquists were favorably regarded by the imperial party; and after the battle of Mühlberg, in 1547, they alone were formally tolerated in Bohemia and Moravia. One of the most celebrated leaders was Jacobus v. Mies. The name Utraquist is still applied to certain districts or villages in Bohemia and Moravia; but it is used not in reference to this theological controversy, but merely to convey that, in these villages or districts, *both languages*, Bohemian and German, are spoken.

U'TRECHT, a province of the Netherlands, bounded on the w. by South Holland, n. by North Holland and the Zuyder Zee, e. by Gelderland, and s. by the Rhine and Leck. It is 42 m. from e. to w., and 21 from n. to south. The chief places are Utrecht, Amersfórt, Rhenen, Wijk bij Duurstede, Montfórt, and Ijsselstein (pronounced I'sselstein), and about 40% of the population are urban residents. Area, 534 sq. m. Pop. '95, 238,282; rather more than 30 per cent. are Roman Catholics; the remainder are Protestants.

The country is varied by beautiful hilly districts, level fields, orchards, tilled land, meadows, and moss. The hilly tract stretches from near Amersfórt to Rhenen on the Rhine, 21 miles. It is well wooded. Rye, oats, and buckwheat are sown; sheep, cattle, and bees extensively kept. To the s. of this belt is rich clay land, producing excellent wheat and barley. Near Amersfórt and Rhenen, tobacco is largely planted.

Utrecht is watered by the Rhine, Vecht, Leck, Amstel, Grebbe, and many other rivers. The inland fishing is trifling; but many herrings, eels, flounders, anchovies, etc., are taken in the Zuyder Zee. Besides agriculture, the industries are soap-boiling, sawing wood, copper and iron founding, making machinery, carpets, tiles, bricks, coarse pottery, cement, etc. There are many beautiful country seats, the climate being dry and healthy.

UTRECHT (*Utrajectum*, or *Trajectum ad Rhenum*), the provincial capital, is beautifully situated in the midst of a district composed of sand-hills, woody heaths, rich grassy meadows, extensive orchards, flower-gardens, and cultivated fields. It lies 23 m. s.s.e. from Amsterdam. When the census was taken (1880), the pop. numbered 67,633; at the end of 1895 it was 94,305. The broad walls have been leveled, planted with trees, and formed into beautiful and well-kept promenades.

Utrecht is favorably situated for trade, being the point from which several railways radiate, and having excellent water-communication by the old Rhine and the Vecht. The staples are grain, cattle, and various manufactures. It is the residence of many noble families, the seat of a university with an observatory, botanical gardens, a chemical

laboratory, and museums. Principal buildings are the cathedral or Domkerk, the town-house, the mint, the university, and several handsome barracks for the infantry and cavalry, especially the Willemskazerne. The cathedral was consecrated to St. Martin about 720. In 1674, a hurricane destroyed the body of the building between the choir and the tower, so that the latter (321 ft. high) is now isolated. The famous university of Utrecht, founded in 1636, numbers about 750 students, and has a good library of 200,000 volumes. Utrecht has been for centuries the headquarters of the Jansenist church (see JANSEN). There is a national school for military surgeons; a grammar-school; normal school for teachers; a musical college, for elementary singing, the piano, and violin; a historical society; meteorological institute; medical society; pharmaceutical society, etc. Education generally stands high.

The charitable institutions are numerous. Principal industries are—manufacturing tobacco and cigars, woolen fabrics and carpets, making salt, furniture, baskets, tin, copper, and silver work, sawing wood, rope-making, iron-founding, book-printing, the manufacture of organs, etc.

Utrecht is one of the oldest cities of the Netherlands, and probably was founded by the Romans. Here the famed union of the northern provinces for the defence of political and religious freedom was formed Jan. 23, 1579. For a short time in 1807, Louis Napoleon, king of Holland, resided in Utrecht. It has been the birthplace of many distinguished men, among others Pope Adrian VI., in 1459.

Utrecht has acquired a degree of celebrity for the treaties there concluded, which brought to a close the war of the Spanish succession. See SUCCESSION WARS. After this disastrous conflict had endured for more than 10 years, Great Britain, finding that the reasons which had prompted her to engage in it no longer existed, tried to induce Austria to come to terms with France, but failing in this, at once signed private preliminary articles for herself, Oct. 8, 1711. On Jan. 12, 1712, a congress was opened at Utrecht; and France, desirous, at almost any price, of detaching Britain from the grand alliance, voluntarily made so many concessions, that the latter had only further to demand the banishment of the elder pretender, whose sojourn in France had been a source of disquietude, the conclusion of a treaty of commerce, and indemnities for her allies—all which points were at once conceded. But the preposterous demands of Austria, which included not only the renunciation by the Bourbons of the entire Spanish empire, but the restoration of all those places which had been ceded to France by the treaties of Münster, Nimeguen, and Ryswick, and the retention of all Austria's conquests in Italy, the Low Countries, and Spain, forced the French to break off the conferences, in the hope of making a separate peace with Britain, and compelling the other allies, by negotiation or arms, to lower their pretensions. This plan was successful; agreement on all points at issue was established between France and Britain in Aug., 1712; and arrangements were also come to with Holland, Portugal, Prussia, and Savoy soon afterward. As each of the contracting parties negotiated in its own name, no fewer than nine distinct treaties of peace were signed in the following spring, April 11, 1713. By the treaty between France and Britain, the former ceded St. Kitt's, Hudson bay, Nova Scotia, and Newfoundland (the liberty of fishing for cod being reserved), recognized formally the reigning dynasty and the Hanoverian succession, agreed to demolish the fortifications of Dunkirk, engaged that the crowns of France and Spain should never be united, and that no part of the Spanish Netherlands should ever be ceded or transferred to France; and Spain renounced her Italian possessions in favor of Austria, and gave up Gibraltar and Minorca to Britain, with which power she also concluded the *assiento* (q.v.) treaty. The chief of the special agreements with the other contracting parties were as follows: Ypres, Knocke, etc., to be exchanged with Holland for Douai, Bouchain, etc., and a treaty of commerce to be concluded; both banks of the Amazon to belong to Portugal; Spanish gelders and the district of Kessel, to be ceded to Prussia, and its ruler's title of king, assumed in 1701, formally recognized, Prussia in turn resigning all claims to the principality of Orange; the duke of Savoy to obtain Sicily, with the title of king, etc. The treaty of Utrecht did not made peace with Austria and the German empire; but in the following year, at Rastadt and Baden, they agreed to substantially the same terms as were proffered at Utrecht. The electors of Cologne and Bavaria, who had been put under the ban of the empire, were restored; Sardinia, granted to Bavaria at Utrecht, was restored to Austria; Austria renounced her claims to the Spanish succession; the cession of the Spanish possessions in Italy was confirmed; Breisach and Freiburg, in the Breisgau, were also given to Austria; the highest ridge of the Maritime Alps was made the boundary between France and Savoy; and on failure of the Spanish Bourbons, the crown of Spain was to fall to the house of Savoy.—See Lord Mahon's *History of the War of Succession in Spain* (Lond., 1832); Gerard's *History of a Great Treaty.*

UTRE'RA, an old t. of Spain, in the province of Seville, and 18 m. by railway s.e. of the city of that name. In early times, it was flourishing and populous; but fell into a state of stagnancy, from which it has begun to revive along with the rest of Spain. It is important as a military post, contains a beautiful Gothic church, a Moorish castle, and cavalry barracks. The streets and promenades are kept clean and fresh by streams of running water. Utrera contained, '87, 15,010 inhabitants, mostly agriculturists engaged in the productive estates which surround the town. Corn, wine, oil, soap, pottery, and

fruit are produced. Sheep and cattle, as well as a breed of fierce bulls, are reared in the vicinity.

U'TRICLE is the botanical term for a kind of seed like the achenium (q. v.). In the utricle, however, the pericarp does not lie close to the seed, but surrounds it as a loose inflated covering.

UTRICULARIA. See BLADDERWORT.

UTTERING COUNTERFEIT COIN is an offense punishable with one year's imprisonment with hard labor. The punishment is increased if, besides uttering, the person has other counterfeit coin in his possession. It is also an offense to utter false foreign coin as the U. S. coin or as foreign coin.

UTTOX'ETER, a market-t. of Staffordshire, on an eminence above the vale of the Dove, 16 m. n.e. of Stafford. Its church with an ancient tower and lofty spire is a noteworthy building; and the town contains a Latin school. There are iron works and cork manufactures. Pop. '91, 5516.

UVAL'DE, a co. in s.w. Texas, consisting of level, fertile plains; 1420 sq. m.; pop. '90, 3804—chiefly of American birth, with colored. Co. seat, Uvalde.

U'VULA. See PALATE.

UWINS, THOMAS, 1782–1857; b. England; educated for the profession of an engraver, but became a painter in water-colors and oils. His pictures were mostly of Italian scenes, and among the most popular were: "Dressing for the Festa," "The Fisherman's Song of Naples," and "Interior of a Saint Manufactory at Naples."

UXBRIDGE, a market-t. in the co. of Middlesex, on the Colne, 18 m. n.w. of the city of London. Pop. '91, 8206. Its corn market is one of the most important in the kingdom.

V

V, THE twenty-second letter in the English alphabet, is derived directly from the Lat. character *v*, which represented originally both the consonant *v* and the vowel *u* (see U). The name of the letter is derived from the Phenician and Hebrew *vau* (signifying a nail, which the form of the letter originally resembled), which stood sixth in the alphabet, and became the digamma (q.v.) of the old Greek, and the *f* of the Latin (see F). The Greek *υ* (see ALPHABET), from which the Lat. *v* is taken, had, in the classical period, degenerated into a sound like the French *u*, and in modern Greek is undistinguishable from *i*. The Greeks, after they had lost the digamma, represented Lat. *v* by *ου* or *β*; e.g., *Ουαρρων* or *Βαρρων* = Varro, *Βιργιλίος* = Virgilius. In the beginning of Latin words, *v* must have had a consonantal sound approaching that of *v* in English, as is inferred from its persistence as compared with the Greek digamma; e.g., Vinum = (Ϝ)*οἶνος*, Vesta = *Ἑστία*. Between two vowels, on the contrary, it was often dropped out, as in *nuper* for *novumper*, *Jupiter* for *Jovipiter*, *prudens* for *providens;* from which we may conclude that it had in that position the power of a semivowel, like Eng. *w*. In new high German, *v* takes the place of Gothic and Eng. *f* (see F), and is pronounced like *f*, while the *v*-sound is expressed by *w*.

VAAL RIVER, the Dutch name of one of the most important branches of the Gariep or Orange river, and signifying yellow, from the color of its waters when in flood, its Hottentot name, Ky Gariep, having really the same signification; the Betjuans call it Namagari. It rises in the Drakenberg range, at the n.w. angle of Natal, and running a very circuitous course of about 500 m., forming the boundary between the Orange River Free State and the Transvaal on the other, joins the other great branch, the Nu Gariep or Orange river, in lat. 29° 10′ s., long. 24° 15′ east.

VACATION, in legal language, means the holiday usually enjoyed by lawyers in consequence of many of the courts being closed, and thereby some steps in a suit not being competent during part of the autumn of each year. There are short vacations during other parts of the year; but the long vacation is that which extends from Aug. 10 to Oct. 24, and during that part of the year it is usual for legal business to be in great measure suspended.

VACCINATION is the process by which a specific disease, termed *vaccinia*, or cow-pox (from the Latin word *vacca*, a cow), is introduced into the human organism with the view of protecting it against an attack of an incomparably more severe disorder—viz., small-pox. For the history of this remarkable discovery of vaccination—"that master-piece of medical induction"—we must refer to the life of Jenner (q.v.). In his *Inquiry into the Causes and Effects of the Variolæ Vaccinæ*, published 1798, he established the following facts: (1) That this disease casually communicated to man has the power of rendering him unsusceptible of small-pox; (2) that the specific cow-pox alone, and not other eruptions affecting the cow, which might be confounded with it, had this protective power; (3) that the cow-pox might be communicated at will from the cow to

man by the hand of the surgeon, whenever the requisite opportunity existed; and (4) that the cow-pox once ingrafted on the human subject, might be continued from individual to individual by successive transmissions, conferring on each the same immunity from small-pox as was enjoyed by the one first infected direct from the cow.

The *method of vaccinating* and the *phenomena of cow-pox*, as observed in the human subject after vaccination, claim our first and chief attention. Except under circumstances of special risk (as, for instance, where small-pox is in the neighborhood), children should only be vaccinated when they are in apparently good health. Diarrhea and skin diseases are especially to be avoided; and it is important to see that there is no chafing behind the ears, or in the folds of the neck or groin. As more than one-fourth of the whole number of deaths from small-pox in England during the six consecutive years 1856–61, took place in children of less than one year, it is obviously expedient that children should be vaccinated in very early infancy, provided health permits. Dr. Seaton, in his comprehensive article on this subject in Reynold's *System of Medicine* (1866, vol. i. p. 489), observes that "plump and healthy children living in large towns should be vaccinated when a month or six weeks old; in more delicate children, the vaccination might be postponed till they are two or three months old; but all, except those whose state of health positively contra-indicates vaccination, should be vaccinated by the age of three months." This early age has also the advantage of being free from the irritation of teething.

The lymph to be used should always be taken from a healthy child, and from thoroughly characteristic vesicles; and when lymph in all respects satisfactory cannot be procured as is often the case in country districts, the operation should be postponed. Lymph is usually taken when the vesicle is fully formed, which is usually about a week after vaccination; if it is not taken till the areola (which will be presently described) is complete, its protective power is far less certain. "Prime lymph," says Dr. Seaton, "has always a certain degree of viscidity; and a thin serous lymph, even from a vesicle which is not advanced, is to be avoided. Babies are much better lymph-givers than elder children or adults; and children of dark complexion, not too florid, with a thick, smooth, clear, skin, yield the finest and most effective lymph." Lymph should always, if practicable, be passed direct from arm to arm; and preserved lymph should only be had recourse to when a vaccinated child cannot be obtained. A good vesicle freely punctured on its surface exudes enough lymph or vaccine matter for the direct vaccination of five or six children, and for charging six or eight ivory points for future emergencies. The process of vaccination consists essentially in introducing the lymph into the structure of the true skin, or in bringing it in contact with the absorbing surface. This may be effected in various ways, one of the most common being by puncture. As the operation is extremely simple, and the knowledge of the mode of performing it may prove not only interesting but generally useful, we shall briefly describe it. The skin on the outside of the arm, below the shoulder, should be held upon the stretch, and a very sharp, clean lancet, well charged with lymph, should be made to puncture the skin from above downward, at an angle of about 45°, and be made just to enter the true skin. The matter thus inserted is retained by the valvular character of the puncture and the elasticity of the skin. In this form of the operation, not less than five or six such punctures should be made, at a distance of half an inch from the other; and for the sake of security, three punctures may be made on each arm. If the lymph is preserved on points, each point, after being held in the steam of hot water so as to dissolve the lymph, should be inserted into the punctures made by an ordinary lancet. Some surgeons make a number of minute superficial punctures over a patch of the size of a ten-cent piece, and spread the lymph over this spot with the flat part of the lancet: this kind of tatooing should be repeated on three spots. Others make a number of parallel scratches, or crossed scratches, with a charged lancet; and others, again, use special scarifiers or rakes, consisting of three or four needle-points inserted in an ivory handle; and drawn either once or again at right angles over the tense skin, the lymph being then plastered over the scarified surface. Of these various plans, Dr. Seaton believes that the best marks and most successful treatment result from this last plan of cross scratches. A far better plan of preserving lymph than that of drying it on points, is that of preserving it in a fluid state in carefully closed capillary tubes, in which form it is ready for use without any preparation. When the operation is successfully performed, the skin at the spot becomes slightly elevated, hard, and red on the third or fourth day; on the fifth or sixth day a vesicle of a blueish-white color forms, which presents an elevated edge and a depressed cup. It is distended with clear lymph, and attains its perfection on the eighth day; and now, or on the ninth day, the vesicle is surrounded by an inflamed ring or areola; on the ninth, tenth, and eleventh days the vesicle becomes a pustule, the cupped form disappears, the areola enlarges till it becomes a circle, with a diameter of from one to three inches. On the twelfth, thirteenth, and fourteenth days the pustule dries up; and in the course of the next week the scab separates and falls off; it seldom remains so long as the twenty-fifth day. It leaves a cicatrix, which commonly is permanent in after-life, circular, somewhat depressed, dotted or indented with minute pits, and in some instances radiated. The establishment of the areola is accompanied with constitutional disturbances, as indicated by restlessness and heat of skin, frequent derangement of the stomach and bowels, and occasional swelling of the glands of the

arm-pit. These symptoms are seldom severe, but seldom quite absent. We occasionally meet with cases in which the course of the above symptoms is modified, as when they are simply retarded, or simply accelerated, or altogether irregular and spurious; and it should be carefully borne in mind that "a vaccination presenting any deviation from the perfect character of the vesicle and the regular development of the areola, is not to be relied on as protective against small-pox."—Seaton, *op. cit.* As a general rule, neither the local nor the constitutional symptoms of ordinary vaccination require any treatment

From investigations conducted some years ago by the English government, and published in several of the *Reports of the Medical Officer of the Privy Council*, it appears that amongst the poorer classes, vaccination is often so imperfectly performed as to leave no mark, and to exert no protective power. Experts in the subject believe that with good lymph, and the observance of all proper precautions, a good vaccinator should not fail of success in his attempts to vaccinate above one in 150 cases; while Dr. Seaton puts one failure as a fair proportion in 170 cases.

The official inquiries above referred to, in the course of which the arms of nearly half a million vaccinated children were examined, prove, says Dr. Seaton, who was employed in the investigation, the great extent to which imperfect or insufficient vaccination has obtained: taking the country throughout, not more than one child in eight was found to be so vaccinated as to have the highest degree of protection that vaccination is capable of affording; and not more than one in three could, on the most indulgent estimate, be considered as well protected. The main causes of this imperfect success were the following: "(1) The frequency with which practitioners, instead of attempting fully to infect the system, had been satisfied with insertions of lymph sufficient to produce only one, two, or three ordinary vesicles; (2) the want of due attention to the *selection* of the lymph used in vaccinating; (3) carelessness and clumsiness in the performance of the vaccination, so that, if the operation did not wholly fail, it very frequently resulted in a less degree of effect than it had been the aim of the operator to produce; and (4) the great and unnecessary extent to which the use of preserved and conveyed lymph was substituted for vaccination direct from the arm."—Seaton, *op. sit.*, p. 503. The following observations made by Drs. Buchanan and Seaton during the epidemic of small-pox in London in 1863, on upwards of 50,000 children in various national and parochial schools, workhouses, etc., are of such extreme importance that we make no apology for inserting them. Some of the children had never been vaccinated; the large majority had been vaccinated in various manners and degrees. Of every 1000 children without any mark of vaccination, no fewer than 360 had scars of small-pox; while of every 1000 children who had evidence of vaccination, only 1.78, on an average, had any such traces: and with regard to the quality and amount of the vaccination, it was found that, of children having four or more cicatrices, only 0.62 per 1000 had any trace of small-pox; while of those who had a single bad mark, 19 per 1000 were scarred by small-pox. Hence the best vaccination was more than 30 times as protective as the worst, and the worst was more than 47 times better than none at all. The importance of the completeness of the vaccination, as shown by the cicatrices, is also well shown by the results obtained by Mr. Marson. From the study of more than 15,000 cases at the small-pox hospital, he finds that while the unvaccinated died at the rate of 37 per cent, the vaccinated have died at the rate of only $6\frac{1}{2}$ per cent; the mortality among those with four or more scars being only 0.55, while that among those with only a single scar was 7.73 per cent; so that, while the average risk which vaccinated persons run if they do catch small-pox is about $\frac{1}{6}$ of the risk run by unvaccinated persons, well-vaccinated persons run less than $\frac{1}{70}$ part of the risk. It must further be borne in mind that, while few unvaccinated persons do not at some period of life sustain an attack of small-pox, the cases are comparatively rare in which a well-vaccinated person catches the disorder; so that the protective power of vaccination shows itself in two ways, viz.: (1) in shielding the constitution, in the great majority of cases, from any kind of an attack of small-pox; and (2) in the exceptional cases, of so modifying the disease as almost invariably to deprive it of danger to life, or of those terrible disfigurements which the unmodified disease so frequently leaves behind it.

With regard to the subject of *re-vaccination*, it has been amply demonstrated that its utility and necessity stand upon no speculative reasoning, but upon the broad basis of experience and observation. This operation should be performed with the same care and pains as primary vaccination, nor should it be left to periods when small-pox is epidemic, but should be performed on all persons after puberty, and this is the more necessary for the primary operation is often very imperfectly performed. During an epidemic of small-pox, even young children, if the marks of the primary vaccination are at all imperfect, should most decidedly be re-vaccinated. In re-vaccinating it must always be remembered that "the local results of re-vaccination of any individual give us absolutely no information whatever as to the constitutional condition in which the re-vaccinated person was with regard to the liability to contract small-pox."

Much has been written regarding the *dangers of vaccination;* and the well-known Rivalta case, in which an infant thus communicated syphilis to a whole population in a remote district of Piedmont (see Syphilis); and the death some years ago of a distinguished middle-aged baronet from (as it was alleged) vaccination with impure lymph, have directed special attention to the subject. For the discussion of this subject we

must refer to Creighton's *Jenner and Vaccination* (1888) and Hart's *Truth about Vaccination* (1880), and we will only remark that those who have had most to do with vaccination, and those who have had the most extensive experience in the diseases of children, concur in the belief of the non-communicability of disease by this operation.

The relations between small-pox in man and cow-pox in the cow, claim a passing remark. Jenner believed that they were essentially the same disease, and that they had a common origin in the grease of the horse. Various experiments have been made to inoculate healthy cows with small-pox, and those of Mr. Ceely, of Aylesbury, in 1839 and of Mr. Badcock, of Brighton, in 1840, who induced vesicles by inoculating cows with small-pox virus, and thus obtained a supply of genuine vaccine lymph, place the identity of the diseases beyond all question. The disease really known as grease appears to have nothing to do with cow-pox or small-pox; but the horse occasionally suffers an affection which is precisely the same as the small-pox in man and the cow-pox in cows; and the lymph from this horse-pox has been successfully used. See GERM THEORY.

Much has been done in this country within a few years in the matter of compulsory vaccination. Massachusetts passed laws to regulate vaccination as early as 1809, affixing a penalty of $5 for neglect to comply with regulations. A few years later several other states had followed her example, and in Rhode Island the penalty was a maximum fine of $50 or imprisonment for thirty days. Massachusetts also organized a State Board of Health in 1854, and similar organizations are now (1891) to be found in seventeen states. These, by the co-operation and aid of the National Board of Health, have adopted a set of rules and regulations by which the matter of contagious diseases are, at least, partially controlled. In Jan., 1882, the National Board issued a circular to the heads of the various departments for the vaccination or revaccination of all employés in those departments, and this was very generally complied with. But the most efficient work was done at this time by the Illinois State Board of Health, by which 233,340 vaccinations were performed in a population of over 3,000,000 people. Vaccination, however, is very largely under the control of local Boards, who have full authority to act, and this is frequently done by the Town Board acting in unison with the School Board, and excluding all unvaccinated children from the schools. See Edwardes, *Vaccination and Small-Pox* (1892).

VACCINIA'CEÆ, a natural order of exogenous plants, differing from *ericeæ* chiefly in having an inferior ovary and succulent fruit. Many botanists make it a section of *ericeæ*. About 200 species are known, natives of temperate climates, in all parts of the world, but chiefly in the northern hemisphere. A few species, remarkable as being parasitic, are natives of Peru. The vacciniaceæ are shrubs, and rarely small trees, with numerous round or angular branches, simple leaves on very short stalks, and flowers solitary or in racemes. Whortleberries and cranberries (q.v.) are the most familiar examples of the order. See HUCKLEBERRIES.

VÂCH (literally, speech) is another name of saraswatî (q.v.), the female energy of the Hindu god Brahman.

VACHASPATI (literally, "lord of speech," from the Sanskrit *vâch*, speech, and *pati*, lord) is, in Hindu mythology, one of the usual names of *vrihaspati* (q.v.), the instructor of the gods.

VACHEROT, ÉTIENNE, b. France, 1809; studied at the normal school in Paris; professor there, 1833; succeeded Cousin at the Sorbonne, 1837–51, but was suspended through ultramontane influence; was dismissed, 1852, for refusing to take the oath to Napoleon III., and imprisoned 3 months for his treatise *La démocratie*, and disfranchised till 1870; elected to the national assembly, 1871. He published *Histoire critique de l'école d' Alexandrie; La Métaphysique et la Science; Essais de Philosophie critique; La Religion.*

VACUUM literally means empty space, or space wholly devoid of matter. From Aristotle to Descartes, metaphysical speculators took the question into their own hands, and, of course, wrote nonsense about it. Thus, Descartes commits the absurdity of saying that, if a vessel be perfectly empty, its sides must be in contact—confounding the totally distinct ideas of *matter* and *space*. The dictum that *nature abhors a vacuum*, was employed to account for the rise of water in pumps; but it was presently found that nature did not abhor a vacuum through more than an elevation of about 32 feet. See TORRICELLI. When the subject was taken up by its legitimate owners, the experimental philosophers, such absurdities disappeared, but real difficulties were detected. So far as experiment has yet guided us, we may assert that vacuum cannot exist. The interstellar spaces, though probably devoid of ordinary ponderable matter, or at best only occasionally visited by it, are certainly pervaded by the luminiferous medium. See ÆTHER, UNDULATORY THEORY, that this is matter (q.v.), is amply proved by the effects of its vibrations on the eye, and by the resistance which it has been discovered to oppose to the motion of Encke's comet. It is not merely for the propagation of light and heat that we are forced to assume that the universe is a *plenum;* Newton expressly said (see FORCE, where the quotation is given at greater length) "That gravity should be innate, inherent, and essential to matter, so that one body may act upon another at a distance through a *vacuum*, without the mediation of anything else, by, and through which their action and force may be conveyed from one to another, is to me so great an absurdity, that I believe no man who has in philosophical matters a competent faculty of thinking can ever fall into it." Nothing could be stronger than this; and we have in addition, the results of

modern observation, which show a connection between sun-spots, planetary configurations, and terrestrial magnetism, obviously requiring some material channel to exist between the sun and its secondaries. Faraday's electrical discoveries tend to the same conclusion.

But, in ordinary language, a vacuum is said to be produced (more or less *perfect*) when ordinary ponderable matter, such as air, is more or less completely removed from the interior of a closed vessel. Till the commencement of the present century, the most perfect vacuum that could be obtained was what is called the Torricellian vacuum—i.e., the space above the mercury in a carefully filled barometer-tube. Such a vacuum, however, is almost useless for experimental purposes, and, besides, it contains mercurial vapor.

A suggestion of Davy's, recently re-invented and greatly improved by Andrews, gives the means of procuring a much more perfect vacuum than the Torricellian. An ordinary air-pump removes all but about the $\frac{1}{120}$ of the gas in the receiver—i. e., produces a vacuum of about $\frac{1}{4}$ inch, as it is called. But if the gas employed be carbonic acid, admitted and pumped out several times, so as to get rid, as far as possible, of the last trace of air, the remaining gas will be almost wholly taken up by means of moistened caustic potash previously placed in the receiver. Concentrated sulphuric acid should also be present to desiccate the potash when it has done its work. In this way, Andrews easily obtained a vacuum of abt. $\frac{1}{1500}$ of an inch, which remained unchanged for a fortnight. Here all but $\frac{1}{1850000}$ of the air had been removed. Further improvements, devised by Frankland, Gassiott, and others, have been made in this process, especially for the production of (so-called) vacuum-tubes for the study of electrical discharges; and the exhaustion has been sometimes carried so far that the attenuated matter remaining was unable to conduct the discharge of an induction-coil.

VADE MECUM is a Latin expression meaning literally *go with me*, and is used to designate anything that a person considers so indispensable as to carry it constantly with him, e.g., a book or a field glass.

VAGA, Perino del, or Pietro Buonaccorsi, 1500–47; b. Florence; went to Rome; was employed by Raphael on designs in fresco for the Vatican; became greatly distinguished as a painter after the death of Raphael; was imprisoned during the sack of Rome, 1527; when released he went to Genoa; returned to Rome during the pontificate of Paul III. His style of design was that of Michel Angelo, and he excelled in classical and religious subjects: his finest work is the "Creation of Eve," at Rome.

VAGRANTS, or Tramps. See Beggars.

VAHLEN, Johannes, a renowned and cultured philologist, was born in Bonn in 1830, where he studied, and, after a brief connection with the gymnasium of that place, entered the university in 1854. In 1856 he was made professor in Breslau, 1858 at Freiburg and Vienna, and since 1874 in Berlin as successor to Moritz Haupt. As a pupil of Ritschl he was at first occupied with the remains of ancient Latin poetry, but later with Roman prose-writers and with Aristotle. Among his writings in the former line are to be noted especially: *Enniancæ poesis reliquiæ* (1854), *Cn. Nævii de bello Punico reliquiæ* (1854), an essay on the *Menæchmi* of Plautus (1882), *Ueber die Annalen des Ennius* (1886). In the second department the edition of *Fragmente des Ulpian* (1856), and the *Cicero de legibus* (1871); then numerous essays on Aristotle, in the *Proceedings of the Vienna Academy*, later a critical edition *der Aristotelischen Poetik;* and many articles in periodicals, among them a treatise on *Laurentius Valla*, whose *opusculatria* he edited. For a number of years he was co-editor of the periodical, *Hermes*, and also of the *Zeitschrift für oesterreichische Gymnasien.* Vahlen is a scholar of taste and fine discrimination.

VAIL, Thomas Hubbard, s.t.d., ll.d., b. Richmond, Va., 1812; graduated at Trinity coll., Conn., 1831, and at the Gen. theol. sem., 1835; was ordained priest in the Prot. Epis. church, 1837; held positions in Philadelphia, and in Worcester, Cambridge, Essex, and Taunton, Mass., in Westerly, R. I., and in Muscatine, Iowa. He was consecrated bp. of Kansas, 1864. He wrote *The Comprehensive Church*, *Life of Lyde*, etc. D. 1889.

VAIR. See Heraldry.

VAIS'ESHIKA is the name of one of the two great divisions of the *Nyâya* (q.v.) school of Hindu philosophy, and probably a later development of the Nyâya itself, properly so called, with which it agrees in its analytical method of treating the subjects of human research, but from which it differs in the arrangement of its topics, and more especially by its doctrine of atomic individualities or *vis'eshas*—whence its name is derived.

The topics or categories (*padârthas*) under which *Kan'âda*, the founder of this system, arranges his subject-matter, are the following six: (1) substance, (2) quality, (3) action, (4) generality, (5) atomic individuality, and (6) co-inherence; and later writers of his school add to these a seventh category, viz., non-existence. 1. Substance is the intimate cause of an aggregate effect; it is that in which qualities abide, and in which action takes place. It is ninefold, viz., earth, water, light, air, ether, time, space, soul, and *manas*, or the organ of affection. 2. Quality is united with substance; it comprises the

following 24: color, savor, odor, feel, number, dimension, severalty, conjunction, disjunction, priority, posteriority, gravity, fluidity, viscidity, sound, understanding, pleasure, pain, desire, aversion, volition or effort, merit, demerit, and self-restitution. 3. Action consists in motion, and abides in substance alone. It affects a single, that is, a finite substance, which is matter. Action is either motion upward or motion downward, or contraction or expansion, or motion onward. 4. Generality abides in substance, quality, and action. It is of two kinds, higher and lower—genus and species. 5. Atomic individuality resides in eternal substances, by which are meant the organ of affection, soul, time, space, ether, earth, water, light, and air; it is the ultimate difference, technically called *vis'esha;* such differences are endless; and two atoms of the same substance, though homogeneous with one another, differ merely in so far as they exclude one another. 6. Co-inherence, or perpetual intimate connection, resides in things which cannot exist independently from one another, such as the parts and the whole, quality and the thing qualified, action and agent, species and individual, atomic individuality and eternal substance. 7. Non-existence, the last category, added to the foregoing by the modern Vais'eshikas, is defined by them as being either non-existence, which is without beginning, but has an end—as that of a jar, which did not exist until its antecedent non-existence ceased when being formed out of the clay; or non-existence, which has a beginning, but no end—as that of a jar which is smashed by the blow of a mallet; or absolute non-existence, which, extending through all times, has neither beginning nor end—as when it is said that a jar is not on the ground; or mutual non-existence, which is the reciprocal negation of identity—as when it is remarked that a jar is not a piece of cloth. The nature of each of these substances, qualities, actions, etc., is then the subject of special investigation. Thus, *earth* is said to be that of which the distinguishing quality is odor; it is described as being of two kinds: eternal in its atomic character; and uneternal when in the shape of some product. Again, products are defined as either organized bodies of five sorts, or organs of perception, or unorganic masses, such as stones, etc. Among the qualities, color is defined as that quality which is apprehended only by the sense of sight; which resides in earth, water, and light; which is distinguishable in earth as white, yellow, green, red, black, tawny, and variegated; in water, as white, but not resplendent; in light, as white and resplendent, etc. *Self-restitution*—to give another instance of the definition of the qualities—is described as threefold: as impetus, the cause of activity in earth, water, light, air; and the organ of affection; as the mental process peculiar to the soul, which is the cause of memory; and as elasticity, in mats and similar substances, which causes an altered thing to reassume its former position.

Though this cursory statement must here suffice to give a general idea of the Vais'eshika system, it is worthy of especial notice that, according to it, understanding is the quality of *soul*, and the instruments of right notion are treated of under the head of "understanding (*buddhi*)." Kan'âda admits of only two such instruments, or *pramân'as*, viz., knowledge which arises from the contact of a sense with its object, and inference. Comparison, revelation, and the other instruments of right notion, mentioned in other systems, the commentators endeavor to show are included in these two. Fallacies and other modes of inconclusive reasoning are further dealt with in connection with "inference," though with less detail than in the Nyâya, where these topics are enlarged upon with particular predilection.—The reputed founder of the Vaiseshika is *Kan'âda*, which name the native authorities derive from *kan'a*, minute, and *âda*, eating, and sometimes, therefore, also change into *Kan'abhuj* or *Kan'abhaksha* (*bhuj* and *bhaksha* being synonyms of *âda*). Nothing, however, is known as to the history or date of this personage, as they are involved in the same obscurity which covers most of the renowned writers of ancient India. His work is divided into ten *adhya'yas*, or books, each of which is subdivided into two diurnal lessons; these, again, being subdivided into sections containing two or more *sûtras* (q.v.), on the same topic. Like the Nyâya-Sûtras, the work of Kan'âda has been commended upon by a triple set of commentaries, and popularized in several elementary treatises. The text with the commentary of *S'ankara Mis'ra*—who is not to be confounded with the celebrated Vedânta author—has been edited at Calcutta in 1861 by the Pan'd'it Jayanârâyana Tarka Panchânana, who added to it a gloss of his own; and some of the sûtras have been translated by the late Dr. Ballantyne (Mirzapore, 1851). Of later works on the same system, may be mentioned the *Bhâshâparich chheda*, edited with the commentary called *Siddhântamuktâvali*, and translated by the late Dr. Roer in the *Bibliotheca Indica* (Calcutta, 1850), and the popular *Tarkasangraha* in several editions; edited also and translated by Dr. Ballantyne (2d edit., Calcutta, 1848), who in his preface gives a catalogue of the commentaries which this work has elicited. The reader not acquainted with Sanskrit is, for further information on the subject, referred to these translations, and to the essays on the Vaiseshika system by H. T. Colebrook (*Miscellaneous Essays*, vol. i., Lond., 1837), and Prof. M. Müller, in the 6th and 7th vols. of the *Zeitschrift der deutschen morgenländischen Gesellschaft.*

VAISHN'AVAS is the name of one of the three great divisions of Hindu sects. See INDIA, section *Religion.* The word, derived from *Vishn'u* (q.v.), designates the worshipers of this deity, and comprises a great variety of sects; but this variety itself differs according to different periods of the mediæval history of India, old divisions becoming

extinct, and new ones taking their place. Thus, the account of the Vaishn'avas, as given in a celebrated work of *Anandagiri*, the *S'ankara-dig-vijaya*, or the victory of the great theologian S'ankara over his religious adversaries, would no longer apply in detail to the present condition of the Vaishn'avas; and even some of those varieties mentioned by the late prof. Wilson in his *Sketch of the Religious Sects of the Hindus*, written in 1832, would seem to have disappeared already in our days. The common link of all the sects comprised under the name of Vaishn'avas, is their belief in the supremacy of Vishn'u over the other gods of the Trimûrti (q.v.). Their difference consists in the character which they assign to this supremacy, and to the god Vishn'u himself in the religious and other practices founded on the nature of their belief, and in their sectarian marks. The following sects belonging to this category may especially be noticed here.

1. The *Râmânujas*, or *S'rî Vaishn'avas*, or *Srî-Sampradâyins*. They derive their origin from *Râmânuja*, a celebrated reformer, who was born at Perumbur, in the s. of India, about the middle of the 12th c., and is considered by his followers as an incarnation of *S'esha* (q.v.), the serpent of Vishn'u. He studied at Conjeveram, resided afterward at S'rîranga, and then traveled over different parts of India, where he was especially engaged in combating the professors of different creeds, particularly the S'aivas. On his return to S'rîranga, he was seized by the king Kerika'la Chola, but effected his escape, and found refuge with the Jain king of Mysore, Vitâla Deva, whom he converted to the Vaishn'ava faith. For 12 years he then remained at Mysore; but at the death of the Chola king, returned to S'rîranga, where he spent the remainder of his life in religious seclusion. The Râmânujas address their worship to Vishn'u and his consort, Lakshmî (q.v.), and their respective incarnations, either singly or conjointly. Hence their sect consists of corresponding subdivisions, according as Nârâyan'a or Lakshmî, or Lakshmî-Nârâyan'a, or Râma, or Sîtâ or Sîtâ-Râma, or any other incarnation of these deities, is the preferential object of the veneration of the votary. Their most striking peculiarity is the preparation and the scrupulous privacy of their meals; for should the meal during its preparation, or while they are eating it, attract even the looks of a stranger, the operation is instantly stopped, and the viands buried in the ground. The marks by which they distinguish themselves from other sects are two perpendicular white lines, drawn with a white earth, *gopîchandana*, from the root of the hair to the commencement of each eyebrow, and a transverse streak connecting them across the root of the nose; in the center is a perpendicular streak of red, made with red sanders, or a preparation of tumeric and lime; other marks, representing several of the attributes of Vishn'u, they have either painted or impressed on the breast and each upper arm; and, besides, they wear a necklace of the wood of the Tulasî (holy basil), and carry a rosary of the seeds of the same plant, or of the lotus. The sacred formula with which a member of this sect is initiated into it consists merely of the words *Om râmâya namah'*, "Om, salutation to Râma." Their principal religious tenet is the belief that Vishn u is the cause and creator of all the worlds; that he and the universe are one, though he is of a twofold form, the supreme spirit or cause, and the gross one, the effect or matter. In distinction from the Vedânta, with which their doctrine has otherwise many points of contact, they regard their supreme deity as endowed with qualities, all of which are of course excellent; and teach that the universe consists of *chit*, thinking or spirit, *achit*, unthinking or matter, and *îs'wara*, or god; the relation of which is that of enjoyer, the thing enjoyed, and the ruler of both. The deity, they assume, is or has been visibly present in five modifications, in the objects of worship, as images, etc.; in the incarnations (see under VISHN'U); in certain forms called Vyûhas, viz., Vâsudeva or Kr'ishn'a; Balarâma, Pradyumna, and Aniruddha; and in the subtle form which comprises six qualities—absence of passion, immortality, exemption from pain or care, absence of natural wants, love, and practice of truth—and the human soul; all of which have to be worshiped seriatim, as the votary ascends in the scale of perfection. The chief authoritative works in Sanskrit of this sect are the *Vedânta Sûtras*, with several commentaries, several works on the Vedânta (q.v.) philosophy, the *Pancharâtra* of Nârada; of Purân'as (q.v.), the *Vishn'u-*, *Nâradîya-*, *Garud'a-*, *Padma-*, *Varâha-*, and *Bhâgavata-Purân'a;* and besides, the works of *Venkat'a*, and several popular works in the dialects of the south. It is in the s. that the followers of Râmânuja, and their temples and establishments, are still numerous; in the n. of India, where they are better known as *S'rî Vaishn'avas*, they are not of frequent occurrence.

2. The *Rámánandas Rámávats*. They are by far the most numerous class of sectaries in Gangetic India: in the district of Agra, they alone constitute seven-tenths of the ascetic population. They belong chiefly to the poorer and inferior classes, with the exception of the Rajputs and military Brahmans. The founder of this sect was *Rámánanda*, who, by some, is considered to have been the immediate disciple of Râmânuja, by others, the fifth in descent from that teacher, when he would have lived about the end of the 13th c.; but other more reliable accounts place him toward the end of the 14th, or the beginning of the 15th century. According to common tradition, Râmânanda seceded from the Râmânujas to whom he originally belonged, because, having spent some time in traveling through various parts of India, and in consequence having been suspected by his fellow-disciples not to have conformed to the rule of the Râmânujas in taking his meals, he was condemned to feed in a place apart from the rest of them, but did not acquiesce in the affront thus offered him. His residence was at Ben-

ares, at the Pancha Gangâ Chât', where a *math*, or monastery, of his followers is said to have existed. The especial object of their worship is Vishn'u, in his incarnation as *Râmachandra*, and his consort *Sîtâ*, and, as amongst the Râmânujas, these deities either singly or jointly. Some members of this sect also pay adoration to other forms of Vishn'u; and the religious mendicants of the sect consider all form of adoration superfluous, being content with the incessant invocation of Krishn'a and Râma. Their practices are less precise than those of the Râmânujas; but the most important difference between them consists in the fact that Râmânanda abolished the distinction of caste among the religious orders, and taught that a *Vairâgin*, or one who quitted the ties of nature and society, shook off at the same time all personal distinction. The initiatory formula of Râmânanda is *S'rî Râma*, or "blessed Râma." Their sectarian marks are the same as those of the Râmânujas, except that the red perpendicular streak on the forehead is varied in shape and extent, and generally narrower than that of the Râmânujas. There are various subdivisions of this sect, believed to have been founded by several eminent disciples of Râmânanda. Their doctrines vary often from that of the latter, but they maintain an amicable intercourse with the Râmânujas and with each other. The twelve chief disciples of Râmânanda were *As'ánand, Kabîr, Raidás, Pipá, Sursurânand, Sukhânand, Bhavânand, Dhavana, Sena, Mahânand, Paramânand,* and *S'rî Anand;* and besides these *Nábhâji*, the author of the Bhaktamâlâ, *Sûr-Dás, Tulasî-Dás*, the translator in Hindi of the Râmâyan'a, and the author of many popular works which exercise a considerable influence on the Hindu population, and the poet *Jayaadeva*, the author of the Gîtagovinda. Many legends, of course, are related of these personages, especially in the Bhaktamâlâ, the favorite work of this sect.

3. The *Kabîr Panthis.* The founder of this sect, one of the most interesting and important in upper and central India, except, perhaps, in Bengal itself, was Kabîr, the most celebrated of the twelve disciples of Râmânanda before mentioned, who, therefore, probably lived about the end of the 14th century. The circumstances connected with his birth, life, and death are all related as miraculous; and so little is certain about his life that even the Mussulmans claim him as one of their persuasion. But his great conversancy with the Hindu *S'âstras*, and his limited knowledge of the Mohammedan authorities, render such a supposition highly improbable. According to the doctrine of this sect, there is but one God, the creator of the world; but, in opposition to the Vedânta (q.v.), they assert that he has a body formed of the five elements of matter, and a mind endowed with the three *gun'as*, or qualities: he is of ineffable purity and irresistible power, eternal, and free from the defects of human nature, but in other respects does not differ from man. The pure man is his living resemblance; and after death, becomes his equal and associate. God and man are therefore not only the same, but both in the same manner everything that exists. For 72 ages, God was alone; he then felt the desire to renew the world, which desire assumed the shape of a female form; and this form is Mâyâ (q.v.), or illusion, with whom he begot the triad, Brahman, Vishn'u, and S'iva. He then disappeared, and Mâyâ approached her offspring in order to frame the universe. Vishn'u hesitated to associate with her, and is therefore more respected by the Kabîr Panthis than the other two gods of the triad; but the latter were frightened by her, and the result of their submission was the birth of Saraswatî, Lakshmî, and Umâ, whom she wedded to the three deities to produce the world. To understand the falsehood of Mâyâ is, therefore, the chief aim of man; and so long only as he is ignorant of the source of life, he is doomed to transmigration (q.v.), which, according to the belief of this sect, is also extended to the planetary bodies—a falling star or meteor being a proof, for instance, that it undergoes a fresh change. The moral code of the Kabîr Panthis is, in many respects, creditable to them. Life, they teach, being the gift of God, must not be violated by his creatures. Humanity and truth are two of their cardinal virtues; retirement from the world is deemed desirable; and implicit devotion, in word, act, and thought, to the guru, or spiritual teacher, a supreme duty. But, as regards the latter point, it is characteristic that the pupil is enjoined first to scrutinize the teacher's doctrine and acts, and to be satisfied that he is the sage he pretends to be, before he resigns himself to his control. It is no part of their faith to worship any deity, or to observe any ceremonies and rites of the Hindus; but they are recommended outwardly to conform to all the usages of tribe and caste, and some even pretend to worship the usual divinities, though this is not considered justifiable. They have no peculiar mode of dress, and though some wear the sectarian marks of the Vaishn'avas, and the necklace and rosary, all these outward signs are considered of no importance. Though, therefore, properly speaking, they can scarcely be included amongst the Vaishn'ava sects, yet their paying more respect to Vishn'u than to any other god of the Trimûrti (q.v.), and the fact of Kabîr having been a disciple of Râmânanda, also the friendly intercourse which they maintain with most of the Vaishn'ava sects, cause them always to be looked upon as belonging to them. The doctrines of Kabîr are taught in a great variety of works in different dialects of Hindi, all of which are the acknowledged compositions of his disciples and successors. The principal are the *Sákhîs*, 5,000 in number, consisting of one stanza each; the *Bîjak*, in 654 sections; and the *Sukh Nidhân.* The sect itself is split into a number of subdivisions, and twelve branches of it are traced to the following personages: *S'rutgopál Dás*, the author of the Sukh Nidhân—his successors preside over the Chaura at Benares; *Bhâgo Dás*, the author of the Bîjak;

Nárâyan Dás and *Churâman' Dâs*, the two sons of a merchant at Jabbalpur; *Jaggo Dâs*, of Kuttack; *Jîvan Dâs; Kamâl*, of Bombay; *Tâk Sâlî*, of Baroda; *Jnânî*, of Majjhni, near Sahâs'râm; *Sâheb Dâs*, of Cuttack; *Nityânand*, and *Kamál Nâd*, in the Dekhan. The principal establishment of the sect is the Kabîr Chaura at Benares.

4. The *Vallabhácháryas*, or *Rudra Sampradáyins*. The original teacher of this sect is said to have been *Vishn'u Swámin;* but it is a later successor of his, *Vallabha Swámin*, or *Vallabha Acha'rya*, who, from the influence which his teaching and writing exercised on the propagation of his doctrines, must be considered the real founder of this sect. He was born in 1479, in a forest called Champâran'ya, where his parents deserted him on a pilgrimage they had undertaken to Benares. The gods, of course, took care of the infant, and his parents, who recovered him afterward, took him to Gokula, a village on the left bank of the Jumna, a short distance from Mathura, where he received his first education. In his twelfth year he left this place in order to propagate throughout India his tenets, which at that time, it must be understood, he had already framed. On arriving at a certain town in the s. of India, he became acquainted with a person of influence, *Damoradás*, whom he converted to his doctrine. Both of them then proceeded together to the city of Vijayanagar, where the maternal parents of Vallabha resided. He was now introduced to the court of the king of Vijayanagara, Krishn'adeva, and succeeded so well in his disputation with the S'aivas and Smârta Brâhmans that not only the king bestowed on him rich presents, but the Vaishn'avas elected him as their chief, with the title of Âchârya, or spiritual teacher. He then traveled to Ujjayin, Allahabad, and Benares, and from there for 9 years through different parts of India, until, on his return to Brindâvan, as a reward for his exertions and faith, he was honored by a visit from the god *Kr'ishn'a* in person, who enjoined him to introduce his worship, and to found the religion now so widely diffused throughout western India under the sectarian name of *Rudra Sampradáya*. Vallabha ultimately settled at Benares, and there composed 17 works in Sanskrit, the most important of which are a commentary on the Vedânta (q.v.) and Mimânsâ (q.v.) Sûtras, and one on the Bhâgavata Purân'a; works, however, only intended for the learned, and now very rare. He died on a hill in the vicinity of Benares, in his 53d year, after having made 84 devoted disciples. He was succeeded by his second son, *Vithalnâthji*, who was born in 1516, in the village of Parn'ât, and is known amongst the sect by the designation of S'rî Gosâin Jî, his father Vallabha's sectarian name being S'rî Achârya Jî. Vithalnâthji died in 1583, and left besides four daughters, seven sons, who were all teachers, and formed as many communities, viz.: *Girdharji* (born 1540), *Govinda Ráy* (born 1542), *Bâlkr'ishn'aji* (born 1549), *Gokulnâthji* (born 1551), *Ragunâthji* (born 1554), *Jadunâthji* (born 1556), and *Ghanashyamji* (born 1561). It was, however, *Gokulnáthji* who became the most celebrated of the descendants of Vithalnâthji, for to him especially is due the vitality of this sect, and even to the present day the followers of his descendants consider their own Gosâins the only legitimate teachers of their faith, while even the adherents of the other sons of Vithalnâthji pay them the greatest respect. It is about the period when the sons of Vithalnâthji dispersed that they first acquired the title of *Mahârâj*, or "great king," by which the chiefs of this sect are now best known, though besides this proud designation they have other distinctive titles, such as *Vallabha Kula*, *Agni Kula*, *Guru*, etc. The heads of the Gokulnâthji division of this sect are usually called *Gokul Gosâins*, or *Gokulastha Gosâins*. The members of this sect are widely diffused throughout Bombay, Cutch, Kattywar, and central India, and especially the province of Malwa. Their establishments and temples are numerous throughout India, especially at Mathura, Brindâvan, and Benares. The most celebrated of all is at S'rî Nâth Dwâr, in Ajmeer, and the members themselves belong to the better and wealthier classes of the Hindu community. At present there are about 60 or 70 "Mahârajas" of this sect dispersed over India, 8 or 10 of whom reside at Bombay alone, and 15 or 16 at Gokul. But so much degenerated are they as a body, that only 2 or 3 of them have any knowledge of Sanskrit; the rest, as a distinguished writer on this sect, Mr. Karsandâs Mulji, asserts, being grossly ignorant; for, as Wilson remarks, it is a curious feature in the notions of this sect that the veneration in which he Gosâins are held is paid solely to their descent, and unconnected with any idea of their sanctity and learning; and that, though they are not unfrequently destitute of all pretensions to individual respectability, they nevertheless enjoy the unlimited homage of their followers.

The chief authority of the sect is the *Bhâgavata Purân'a* (q.v.), and after it the works of Vallabha and various books, 74 in number, 39 of which are translations from Sanskrit, and the rest original compositions in the Brijbâshâ dialect. The object of their adoration is Vishn'u (q.v.) in his incarnation as Kr'ishn'a, whose residence is Goloka, far above the three worlds. There he originally lived alone, but in meditating on the works of creation, created a female form, which became the primary agent in creation: This was Mâyâ. He then produced crude matter, the five elements, and all the divine beings; the gods of the Trimûrti, their female consorts, and 300,000,000 of Gopîs, or cowherdesses, who are the especial attendants on Kr'ishn'a. The principles of the sect, as laid down by Vallabha, are the following ten: 1. To secure the firm supprt of Vallabhâchârya; 2. To exercise chiefly the worship of Kr'ishn'a; 3. To forsake the sense of Vaidik opinion and be a suppliant to Kr'ishn'a; 4. To sing praises with feelings of humility; 5. To believe that Vallabha is a Gopî, or mistress of Kr'ishn'a; 6. To swell the heart with the

name of Kr'ishn'a; 7. To forsake his commands not for a moment; 8. To put faith in his words and doings; 9 To adopt the society of the good, knowing them divine; and, 10. To see not the faults, but speak the truth. Out of this code, however, grew up the doctrine that the Guru or Mahârâj is the impersonation of Kr'ishn'a himself, that God and the Guru are necessarily to be worshiped, and that the sectary is bound to bestow on him "his body, organs of sense, life, heart, and other faculties, and wife, house, family, property, with his own self." The gross abuse which was made of this tenet became apparent in a very remarkable trial, the so-called Mahârâj libel case, which took place in 1861 in the supreme court of Bombay, and revealed the licentiousness of one of the then Mahârâjas of the sect of Bombay; the defendant sued for libel by this Mahârâj being a highly respected and distinguished member of the sect, Mr. Karsandâs Mulji, who had had the courage of calling, in a native newspaper, on the Mahârâjas to reform and to return to the ancient Hindu faith, and whose public conduct on that occasion elicited the highest praise of the court, and, it is to be hoped, initiated a better era of this sect. The temples of the sect have images of Kr'ishn'a, and Râdhâ, his principal wife; the former representing a chubby boy, of a dark hue, who is richly decorated, and eight times a day receives the homage of his worshipers. The ceremonial which on those occasions take place are the *mangala*, or morning levee, about half an hour after sunrise, when the image is washed and dressed, and presented with refreshments; the *s'ringâra*, when the image having been anointed and perfumed, holds his public court—this takes place about an hour and a half after the preceding; the *gwâla*, 48 minutes after the last, the image being now visited preparatory to its going out; the *râjabhogâ* held at mid-day, when Kr'ishn'a is supposed to have come home from the pastures and sat down to dine—all sorts of delicacies are then placed before the image, and distributed to the votaries present; the *utthâapana*, three hours before sunset, when the god is summoned to get up from his siesta; the *bhoga*, or afternoon meal, about half an hour later; the *sandhyâ*, about sunset, or the evening toilet of the image; and the *s'ayanâ*, or retiring to repose, about 7 in the evening; the image then being put upon a bed and refreshments being placed near it, when the votaries retire, and the temple is shut till the ensuing morning. Besides these ceremonies, there are other annual festivals observed by this sect throughout India; of these the *Rath Yâtra*, or procession of the god in a chair, is the most celebrated in Bengal and Orissa; the most popular at Benares is the *Janmâshtamî*, or the nativity of Kr'ishn'a; and the *Râs Yâtra*, or annual commemoration of the dance of Kr'ishn'a with 16 Gopîs—a very popular festival, at which all kind of rejoicings take place. The mark on the forehead of the Vallabhâchâryas consists of two perpendicular lines meeting in a semi-circle at the root of the nose, and having a round spot of red between them. On the breasts and arms they have the same marks as the Râmânujas, made with a black earth called *S'yâmabandî*, or any black metallic substance; their necklace and rosary are made of the stalk of the Tulasî (holy basil) plant. For a fuller account of this sect, its authorities, festivals, and worship, and the practices of the Mahârâjas, see the interesting *History of the Sect of Mahárájas or Vallábhácháryas in Western India* (by Karsandâs Mulji—London, 1865), which also contains the history of the "Mahârâj Libel Case" above referred to.

5. The *Mâdhwâcháryas* or *Brahma Sampradâyins*. This sect occurs especially in the peninsula, and was founded by a Braham, *Mâdhwâchârya*, who is looked upon by his followers as an incarnation of Vâyu, the god of wind, after having been incarnate in preceding ages as Hânuman (q.v.) and Bhîma. He was born in the year 1199, and educated in a convent at Anantes'war. In his ninth year he was initiated into the order of anchorites by Achyuta Pracha, a descendant of Sanaka, a son of Brahman. At that early age he composed a commentary on the Gîtâ; then traveled to the Himâlaya, and, when returned, erected at Udipi the image of Kr'ishn'a, which had been originally made by Arjuna, and miraculously recovered by him. In addition to the principal temple at Udipi, he established eight other temples in Tuluva, below the Ghâts; composed, it is related, 37 works, and, on a controversial tour, triumphed over various divines. In his 79th year he went to Badarikâs'rama, where, the legend says, he continues to reside with Vyâsa, the compiler of the Vedas and Purân'as. It seems that he was originally a priest of the S'aiva faith, and one of his names, *Ananda T'îrtha*, even indicates that he belonged to the class of Das'namî Gosâins, who were instituted by *S'ankarâchârya* (q.v.). He encouraged, therefore, an attempt to form a kind of compromise between the S'aivas and Vaishn'avas; and in the temples of his sect, images of S'iva are allowed to partake of the worship offered to those of Vishn'u. Votaries of the Mâdhwa Gurus and of S'ankarâchârya Gosâins offered also the reverential obeisance to their teachers mutually, and the latter visit the temple of the former to perform their adoration at the shrine of Kr'ishn'a. The essential dogma of this sect is the identification of Vishn'u with the supreme soul, as the pre-existent cause of the universe; and this primeval Vishn'u they affirm to be endowed with real attributes, and, although indefinable, to be most excellent and independent. But besides this independent, there is also a dependent, principle; for besides the supreme soul, *Paramâtman*, there is a living soul, *Jîvâtman*, which is dependent on the supreme; and though indissolubly connected with, yet not the same with him. In consequence, they deny the absorption of the human soul into the universal spirit, and the loss of independent existence after death. In this respect they differ, therefore, on a vital point of doctrine, from the members of other Vaishn'ava and

S'aiva sects. The manner in which they conceive the universe to have issued from the Supreme Being is to a great extent analogous to that of the other Vaishn'avas; and they also receive the legends of the Vaishn'ava Purân'as relating to the birth of Brahman, from the lotus, which grew out of the navel of Vishn'u, etc. The modes of worshiping Vishn'u they declare to be three: marking the body with his symbols, especially by means of a hot iron; giving his names to children and objects of interest; and the practice of virtue in word, act, and thought. That in word consists in telling the truth, giving good counsel, mild speaking, and study; that in act comprises liberality, kindness, and protection; and clemency, freedom from envy, and faith are the practice of virtue in thought. Final liberation, or freedom from future birth, they consider as the reward for having secured the favor of Vishn'u by sedulously worshiping him; and those who have attained it enjoy felicity in Vishn'u's heaven, under one or all of the four conditions: of being similar to him in form, of remaining in his visible presence or in his proximity, and of sharing equal power with him.

Their worship is not materially different from that of the other Vaishn'avas, except in one peculiarity, which proves that they have a friendly leaning toward the S'aiva sect; for the images of S'iva, Durgâ, and Gan'es'a are placed by them in the same shrine as Vishn'u. The Gurus, or superiors, of this sect are Brahmans and asceties, or profess cœnobitic observances; the disciples live in their *maths*, or monasteries, and profess also perpetual celibacy. The lay votaries of these teachers are members of every class of society except the lowest. The Gurus adopt the external appearance of ascetics, laying aside the Brahmanical cord, carrying a staff and water-pot, going bareheaded, and wearing a single wrapper of an orange color. The marks common to them and the lay votaries are the symbols of Vishn'u upon shoulders and breast, and the frontal mark, consisting of two perpendicular lines made with the white clay *Gopîchandana*, and joined at the root of the nose, like that of the Râmânujas; but instead of a red line down the center, they make a straight black line with the charcoal from incense offered to Nârâyan'a, terminating in a round mark made with turmeric. The scriptural authorities of this sect are, besides the writings of its founder, the four *Vedas*, the *Mahâbhârata*, the *Panchârâtra*, and the original *Râmâyan'a*.

6. The *Vaishn'avas of Bengal*, the far greater number of worshipers of Vishn'u, in Bengal, form one-fifth, or according to another estimate, nearly one-third of the population of this province. Their founder, *Chaitanya*, was the son of a Brahman settled at Nadîya, but originally from Silhet. He was born in 1485, and his birth was accompanied by the usual potentous indications, described in Hindu legends, of a superhuman event. He was, in fact, an incarnation of Kr'ishn'a, who appeared for the purpose of instructing mankind in the true mode of worshiping him in this age. Up to his 24th year Chaitanya seems to have lived without any great pretensions to sanctity; he married, it is said, a daughter of Vallabhâchârya, and supported his mother after the death of his father, which occured in his childhood. At twenty-four, however, he shook off the obligations of society, and became an ascetic, traveled between Mathurâ and Jagannâth, and taught his doctrine. At the end of his peregrinations, he nominated his two principal disciples, *Adwaitânand* and *Nityânand*, to preside over the Vaishn'avas of Bengal, and *Rûpa* and *Sanâtana* over those of Mathurâ. Chaitanya himself then settled at Cuttack, where he remained twelve years, engaged in teaching and controversy, and in intent meditation on Kr'ishn'a. There he had frequent visions of Kr'ishn'a, Râdhâ, and the Gopîs, and in one of these fits of ecstasy, was nearly drowned in the Jumna. Ultimately, he disappeared—how, is not known—about 1527. Of his two chief disciples, *Adwaitânand* resided at S'ântipur, and seems to have been a man of some property and respectability. *Nityânand* was a resident of Nadîya, and a householder, and his descendants are still in existence. Besides these three Prabhus, or chiefs, the Vaishn'avas of Bengal acknowledge six Gosâins as their original teachers, viz., *Rûpa, Sanâtan, Jîva, Raghunâth Bhat't', Raghunâth Dâs*, and *Gopâl Dâs;* and next to them they hold in veneration *S'rînivâs, Gadâdhar Pan''dit, S'rî Svarûpa, Râmânand*, and others including *Hâridâs*, who especially obtained almost equal honor with his master Chaitanya. In addition to these chiefs, the sect claims eight eminent poets, among whom *Krishna Dâs* is the most celebrated. According to the doctrine of the sect, *Kr'ishn'a* is the supreme spirit, who, for various purposes, assumed specific shapes, in which he became incarnate (see VISHN'U); and so far there is not much real difference between the tenets of this and other Vaishn'ava sects. But an important innovation, introduced by its founder, is the doctrine of *Bhakti*, or faith, which, he teaches, is infinitely more efficacious than abstraction, than knowledge of the divine nature—as enjoined by the philosophical systems—than the subjugation of the passions, than the practice of the Yoga, than charity, virtue, or anything deemed most meritorious. A consequence resulting from this doctrine is, that all castes become by such faith equally pure, and therefore that all castes are admissible into the sect; that all are at liberty to sink their social differences in the condition of ascetics, in which character they may live with each other without regard to former distinctions, and that all members of the sect are equally entitled to the food which has been previously presented to the deity. The *Bhakti*, or faith, comprehends five stages: quietism, as that of sages; servitude, which every votary takes upon himself; friendship for the deity, such as is felt by Bhîma and others honored with his aquaintance; tender affection for the deity, of the same nature as love of parents for their

children; and the highest degree of affection, such passionate attachment as the Gopîs felt for their beloved Kr'ishn'a.

The manner of expressing these feelings in acts of divine worship is about the same as that represented by the ceremonial of the Vallabhâchâryas; but the secular worshipers are generally content with paying their homage twice a day to the idol of Kr'ishn'a. Their chief ritual is a very simple one; it consists of constantly repeating the name of Kr'ishn'a—a practice of which one of their chiefs, Haridâs, set them a remarkable example, as during many years, when he resided in a thicket, he repeated the name of Kr'ishn'a 300,000 times daily. Their other duties are sixty-four, including many moral and many absurd observances, as suppressing anger, avarice, and lust, and singing and dancing in honor of Kr'ishn'a, and fasting every eleventh day. The most important of all their obligations, however, is their servile veneration of the spiritual teacher, whom they are bound to look upon as the deity himself, and even as possessed of more authority; for they are taught that "the prayer is manifest in the Guru, and the Guru is Vishn'u himself;" again: "First, the Guru is to be worshiped, then I (Vishn'u) am to be worshiped;" and, "when Vishn'u is in anger the Guru is our protector; but when the Guru is in anger, we have none." In this respect, the doctrine of the Vaishn'avas of Bengal is similar to that of the Vallabhâchâryos, and their practice also agrees in so far as the Vaishn'avas look upon the dignity of their Gurus as hereditary, and not depending on personal capacity or sanctity; but, as in the case of the Vallabhâchâryas, this practice does not appear to have been enjoined by their original teachers. Liberation from terrestrial existence, most votaries of this sect do not conceive in the spirit of the Vedânta, which teaches that final deliverance is the absorption of the human soul into the divine essence; but, in their opinion, it is twofold, either perpetual residence of the soul in Swarga, or paradise, with possession of the divine attributes of power, etc.; or elevation to *Vaikun't'ha*, the heaven of Vishn'u, where they enjoy felicity under one or all of the four conditions, under which also the Madhwâchâryas conceive such felicity to exist. Chaitanya and his two chief disciples did not leave, as it seems, written compositions; the rest of his pupils, however, wrote numerous works in Sanskrit and Bengali. The Vaishna'vas of this sect are distinguished by two white perpendicular streaks of sandal, or *Gopîchandana*, down the forehead, uniting at the root of the nose, and continuing to near the tip; by the names of *Râdhâ-Kr'ishn'a* stamped on the temples, breast, and arms; by a close necklace of Tulasî stalk of three strings, and a rosary of 108 or sometimes 1000 beads made of the stem of the Tulasî. The sectaries consist of every caste and order, and are governed by the descendants of their Gosâins: some live in a state of celibacy; the teachers, however, are married men.

There are several divisions of this sect, arising from the various forms under which Vishn'u is worshiped; but besides them, there are three which may be looked upon as seceders from the original sect—viz., the *Spasht'a Dâyakas*, the *Kartâ Bhâjas* and the *Sâhujas*.

The *Spasht'a Dâyakas* deny the divine character and authority of the Guru, and allow the association of male and female cenobites in one conventional abode, where their relation is that of brothers and sisters, and their common interest the worship of Kr'ishn'a and Chaitanya. The women act also as the spiritual teachers of the females of respectable families, and the consequence is the growing diffusion of the doctrines of this sect in Calcutta, where it is especially established. The *Kartâ Bhâjas* are of very recent origin, and, as they acknowledge the absolute divinity of the Guru, there would not be much difference between them and the original body of the Vaishnavas of Bengal, had they not broken through the old line of hereditary teachers, and invested a new family with spiritual power—viz., that of their founder, *Râma-S'aran-Pâl*, who at the beginning of this century, was successful in his attempt to create this schism. Of the *Sâhujas*, very little is known, their professions and practices being kept secret. These are suspected not to be of a very moral character. The chief temples of the Vaishn'avas of Bengal are at Dwarakâ, Brindâvan, Jagannâth, Nedîya, Ambikâ, and Agradwîpa.

Besides these Vaishna'va sects, there are others of less importance, which it must here suffice merely to ennumerate by name—viz., the sect of the *Khâkins*, founded by *Kîl*, the disciple of Krishn'adâs, and established chiefly at Hanumángád'hí, in Oude; the *Mâlûk Dâsas*, founded by *Mâlûk Dâs* about 1600, or at the end of the emperor Akbar's reign—their principal establishment is at Kara Manikpur; the *Dâdû Panthis*, founded by *Dâdû*, a pupil of one of the Kabir teachers, about the same time, and established especially in Marwar and Ajmeer; the *Rai Dâsas*, founded by *Rai Dâs*, a disciple of Râmânanda, a sect, it is said, confined to the very lowest of the mixed Hindu castes, or the workers in hides and leather; the *Senâ Panthis*, who derive their origin from *Senâ*, the barber, the third of Râmânanda's disciples; the *Mîrâ Bâîs*, a subdivision of the Vallabhâchâryas, established by *Mîrâ Bâî*, the daughter of a petty Râjâ of Mertâ, and the wife of the Rân'a of Udayapur; the *Sanakâdi Sampradâyns* or *Nimâvats*, throughout upper India, founded by an ascetic Nimbâditya; the *Râdhâ Vallabhis*, who consider Harivam's' as their founder, a personage who lived about 300 years ago, and established a monastery at Brindâvan; the *Sakhî Bhâvas*, probably owing their origin to the last-mentioned sect; the *Charan' Dâsas*, whose chief seat is at Delhi, founded by *Charan' Dâs*, a merchant of the Dhûsar tribe, who resided at Delhi, in the reign of the second Alemgîr; the *Haris'chandis;* the *Sadhnâ Panthis*, founded by *Sadhnâ*, a butcher; and

the *Mádhavis*, founded by *Mâdho*.—For a fuller detail, see H. H. Wilson's *Sketch of the Religious Sects of Hindus*, edited by Dr. Rost in Wilson's works, vol. i. (Lond.1862).

VALAIS (Ger. *Wallis*), a frontier canton of Switzerland, bounded on the n. by the cantons of Vaud and Bern, and on the s. by Italy. Area, 2,020 sq.m.; pop.'88, 101,985. It forms one long and deep valley, included between two of the loftiest mountain chains of Europe—the Pennine and the Bernese Alps—and is drained by the Upper Rhone, which, rising at its north-eastern extremity, in the glacier of the Gallenstock, falls at the western boundary of the canton into the lake of Geneva. No European territory is more completely isolated by mountains; and it is rendered still more inaccessible by transverse chains, between which are inclosed narrow valleys. The greater part of the surface consists of barren mountain slopes; in their higher elevations, covered with the greatest of the Swiss glaciers. The forests and pasture-lands supply the inhabitants with their chief occupations. But grain-cultivation is not absent; the chief agricultural tract being the level ground, from a quarter of a m. to 3 m. wide, which lies along the main channel of the river. Here corn enough is grown to supply the wants of the inhabitants. The heat at the bottom of the valley is intense in summer, and Indian corn and the vine are grown with great success. The Valais opens into the lake of Geneva, and is connected by great high-roads, and now by railway, with the other parts of French Switzerland and Savoy. The Grimsel and Gemmi passes connect the eastern part of the valley with German Switzerland; and the Great St. Bernard and Simplon (q.v.) passes connect it with Italy. Formerly the cattle, the chief export of Valais, were driven over the Simplon into Italy; but now the railway, which ascends the valley to beyond Sion, on the Simplon road, threatens to divert this trade to western Switzerland and France. The inhabitants of the upper Valais—one-third of the population—speak German; those of the lower Valais, the Vaudois dialect of French. The line which separates the two languages lies along the ridges running n. from the Matterhorn to a point a little to the e. of Leuk. All the inhabitants are Roman Catholic. The Valais is subdivided into dixaines, each of which has its council, and may be said to form a republic. Each of the dixaines sends four members to a larger council or diet meeting at Sion. The upper part of the Valais, throughout the middle ages, acknowledged a very slight feudal dependence on the German empire; the lower part belonged to Savoy. At the period of the struggle of the Swiss with the duke of Burgundy, the upper Valais took possession of the lower Valais, and reduced it to the position of a vassal state; and in this condition it remained until 1798, the period of French conquest, when the distinction was set aside. As stated in the article SWITZERLAND, under the recent constitution, the suffrage was extended to the whole population of Valais, with results little expected by the liberal party in the Swiss diet. Sion (q.v.) and Martigny (q.v.) are the chief towns.

VALCKENAER, LUDVIG KASPAR, an eminent Dutch philologist, b. at Leeuwarden in 1715, studied at Franeker, and in 1741 became professor of Greek there. Subsequently, he was called to Leyden, where he died, March 14, 1785. Valckenaer was an admirable lecturer and commentator on the classics. To a thorough knowledge of their literature and antiquities he added a fine critical discernment and thoughtfulness. Among his more notable performances are his recasting of Ursinus's *Virgilius cum Scriptoribus Græcis Collatus* (Leeuwarden, 1747), his editions of the Greek grammarian Ammonius (Leyd. 1739; Leip. 1822), of the *Phœnissæ* (Franek. 1755; Leip. 1824), and the *Hippolytus* (Leyd. 1768; Leip. 1823), his *Diatribe in Euripidis Perditorum Dramatum Reliquias* (Leyd. 1767; Leip. 1824); his edition of the so-called *Epistles of Phalaris* (Gröning. 1777), and of the *Idylls* of Theocritus (Leyd. 1779–81; new ed., Leip. 1810). He also furnished a rich store of critical observations to Wesseling's Herodotus. Among his posthumous works are his *Callimachi Elegiarum Fragmenta* (Leyd. 1799), his *De Aristobulo Judæo* (Leyd. 1806), and his *Opuscula Philogica, Critica, Oratoria* (2 vols., Leip. 1808).

VALDAI HILLS. See NOVGOROD.

VALDEPE'NAS, a t. of New Castile, in the modern province of Ciudad Real, and 30 m. e.s.e. of the city of that name. It is a straggling mud-built town. Pop. abt. 14,000.

VALDÉS, ARMANDO PALACIO, Spanish novelist of the "Naturalistic" school, was born at Entralgo, in the province of Asturias, October 4th, 1853. His first novel, *El Señorito Octavio*, appeared in 1881. This was followed by *Marta y Maria* (1883), *José* (1885), an "idyll of truth," and *La Hermana de San Sulpicio* (1889). The last mentioned is considered the author's masterpiece, and is widely popular both at home and abroad. Between 1890 and 1895 Valdés has published *Maximina*, *La Espuma*, *La Fe*, *El Maestrante* and *El Origen de Pensamiento*. Nearly all of his works have been translated into English.

VALDÉS, JUAN DE, 1500–41; b. Spain; went to Germany, and was converted to the principles of the reformation, though he seems to have been no partisan, but to have sought the unity of the faith; resided at Naples, and became secretary to the king; united there with some friends in the study of the Bible, and wrote some commentaries and religious books. After his death his friends were accused by the inquisition of forming a new sect, called Valdesians, some of whom were put to death, others fled to foreign countries. Some of his works, published by an English Quaker, were: *Dos Dialogos; Alfabeto Cristiano; Dialogo de la Lengua; La Epistola de San Pablo á los Romanos i la 1 á los Corintios, ambas traduzidas i comentadas.*

VALDI'VIA, a fertile, generally level province in s. Chil, covered largely by timber, and drained by the Canten, Totten, Valdivia, and Rio Bueno rivers; 8315 sq.m.; pop. '94, (est.) 65, 186; bounded n. by province of Aranco, e. by Andes, s. by Llanquihue, w. by the Pacific, on which it has fine harbors. Valdivia formerly yielded gold largely, but the tyranny of the Spaniards in imposing slavery on the natives led to revolt and the ruin of the mines. The principal occupation is cattle raising. In the Andes region are several volcanoes; the highest, Villarica, 16,000 ft. high. The climate is moist but healthful. Capital, Valdivia.

VALDI'VIA, Pedro de, about 1498–1555; b. Spain; went with Pizarro to Peru; participated in the conquest of Venezuela, 1535; aided Pizarro in subduing the rebellion under Almagro; conquered Chili, 1540; founded Santiago, 1541, and Coquimbo, 1544; upon the murder of Francisco Pizarro, was recalled to Peru; appointed capt.-gen. of Chile, and of whatever countries s. of Peru he might conquer; founded the cities of Concepcion, Villa Imperial, Villa Rica, in 1551; conquered the Araucanians, who afterward took him prisoner and put him to death.

VÁLEI, a name given to the plantain in southern India. See Plantain.

VALENCE, a t. of France, capital of the dep. of Drôme, in a charming situation on the flank of a hill that borders the left bank of the Rhône, 65 m. s. of Lyons by railway. The walls with which it is surrounded give it a gloomy appearance. Silk-weaving and silk-throwing are carried on, manufactures of printed and other cottons, glassware, leather, and gloves, and commerce in silk, fruits, wines, liquors, and spirits. Pop. '91, 22,947.

VALEN'CIA, a small island on the s.w. coast of Ireland, forms part of the county Kerry, is separated from the mainland by a narrow arm of Valencia bay, and lies 38 m. w.s.w. from Killarney. It is 5½ m. long and 2 m. broad; the soil is in many places good; half the entire area is under cultivation; and there are about 2500 inhabitants. On the w. side, which is mainly high rocky moorland, there are valuable slate and flag quarries. On the n. side of the island is Valencia bay, an inlet of Dingle bay; and Valencia harbor, the most western in Ireland, is part of the bay of the same name. Here is the telegraphic station for three Atlantic cables, now in operation, which were laid in 1866 and 1880. Another Atlantic cable starts from Balinskellig bay, a little to the s. of Valencia. See Telegraph and Atlantic Telegraph.

VALENCIA, a former kingdom of Spain, now subdivided into three modern provinces of Valencia, Alicante, and Castellon de la Plana (see Spain), comprises a tract of country in the e. of Spain, washed by the Mediterranean, and bounded on the n. by Catalonia, and on the s. and s.w. by Murcia.

In the middle districts of the kingdom are small plains, abounding in lagoons where they border on the Mediterranean, but furnished with few harbors; both in the n. and s. are mountain ridges, offsets from the eastern edge of the great central plateau of Spain. Valencia is remarkable for its fine climate, and for its fertility in the well-watered districts. The fruitful localities called the *huertas* (gardens) yield three, and sometimes four harvests in the year. Neither wheat nor barley is largely grown, but the rice-crops are so abundant, that not only is the whole of Spain supplied with this article from Valencia, but a considerable quantity is also exported. The country is rich in iron, lead, copper, cinnabar, cobalt, and coals. The lagoons on the coast, especially that of Albufera, are rich in sea-fowls and fish. The inhabitants, in whom is observable a strong mixture of Moorish blood, are remarkably industrious, and Valencia is known to be the most active manufacturing province of Spain after Cataluña.

VALENCIA, a co. in New Mexico, divided nearly into two portions by the southern projection of Bernalillo co.; area, 8900 sq. m.; pop. '90, 13,876. Co. seat, Los Lunas.

VALENCIA, an ancient city and seaport of Spain, formerly capital of the kingdom, and now of the province of the same name, stands on the shores of the Mediterranean, 294 m. e.s.e. of Madrid by railroad. The Huerta—40 English sq. m. in extent—which surrounds the city, resembles an immense orchard, and is ingeniously watered by an intricate network of pipes and rivulets, laid down by the Moors eight centuries ago, and efficiently answering its purpose down to the present day. In this garden, the carob, citron, orange, palm, and mulberry grow in wild luxuriance. Nature, stimulated by constant moisture and a burning sun, exhibits a wonderful strength and fecundity. Valencia is surrounded by the ruined gates of old walls, erected by Pedro IV. in 1356; the interior of the city is striking and pleasing; most of the streets are macadamized; and while, in the old quarters, the houses are closely packed and gloomy-looking, well suited to keep out the enemy, *heat*—those recently erected are high, gayly colored in blue, rose, cream-color, etc.; decorated with elegant iron-gilt balconies, and furnished with courts freshened with flowers and cooled by fountains. Valencia is the see of an archbishop, and its cathedral, La Seo—the see—which was commenced in 1262, is classical in the interior, and Gothic in the exterior, is 350 ft. long, and at the transepts, 216 ft. wide. From the top of a tower which surmounts one of the portals, the view is said to be one of the most striking in Spain. In the cathedral and its chapels there are a number of magnificent pictures, including some by Ribalta and Joanes. The church of the Colegio de Corpus is quite a museum of pictures by Ribalta, who, according to Ford, has

painted heads equal to any produced by the old Venetians. There are also numerous and interesting picture-galleries, in the chief of which only the productions of the great Valencian school are to be seen. The custom-house, dating from 1758, is now the cigar factory. The university is well attended. Valencia has long been famous for its artistically carved fans, the production of which gives employment to large numbers of workmen. The industry declined somewhat after the introduction of Japanese fans into Europe, but in 1896 there were signs of revival which promised to regain for it its former importance. Other industries are the spinning and weaving of silk, the manufacture of hemp cloth, hats, glass, linen, leather, and Valencia tiles. Its port has been improved; it is now connected with Madrid by railway, and being to its own metropolis what Brighton is to London, it is much visited in summer by the *Madrilenos*, who contribute greatly to its prosperity. There is considerable commerce with Britain. Pop. '87, 170,763.

Valencia, or *Valentia de Cid*, is a very ancient city. It was destroyed by Pompey, and rebuilt by Sertorius, after which it became a *colonia*. It was taken by the Goths in 413 A.D., and by the Moors in 712. The *Cid* took it in 1094–95, and ruled despotically here till 1099. The union of Ferdinand and Isabella brought it under the Castilian crown. Suchet captured the city in 1812.

VALENCIA, a t. of South America, Venezuela, capital of the state of Carabobo, 90 m. s.w. of Caracas, about 2 m. w. of a lake of the same name, and about 24 m. from Puerto Cabello on the coast, with which and with Caracas it carries on an active trade. There are celebrated hot springs in the vicinity. Valencia is finely situated in an exceedingly fertile district, in which cattle and horses are raised in great numbers. Pop. '88, 38,654.

VALENCIENNES, a manufacturing t. and fortress of France, in the department of Nord, on the Escaut, 155 m. by railway n.e. of Paris. It is well built, but it does not contain many objects of attraction of any sort. There are many pleasant promenades in the immediate vicinity. A famous kind of lace is made here, as well as fine woven fabrics and gauzes. There are foundries, rolling-mills, and machine shops. Salt-making and sugar-refining are carried on, and there is an active trade in timber, wine, and oil. It is the birthplace of Watteau and Froissart. Pop. '91, 21,698.

VALENS, Emperor of the East, the brother of Valentinianus I. (q.v.), was born near Cibalis in Pannonia, about 328 A.D., and was associated with his brother in imperial authority, receiving as his share of the empire, Asia, Egypt, and Thrace, March 28, 364. His sovereignty was, however, disputed by Procopius, a supposed scion of the race of Constantine, who raised his standard in Thrace, was crowned at Constantinople, and for two years maintained his ground with skill and courage, till the defeat of his troops at Thyatira and Nacosia, and his subsequent capture and cruel death, 366 A.D. The first prominent act of Valens's reign was a reduction of 25 per cent in the taxes, which gained him the general good-will of his subjects, but was of questionable prudence in the unsettled state of the northern and eastern frontiers. The prolonged imprisonment of 3,000 Ostrogoths, who had been sent to aid Procopius, led to a rupture between Valens and the aged hero Hermanric, and to a war which lasted from 367 to 369. The contest was carried on in the country of the Goths, and was throughout in favor of the Romans. Difficulties arose immediately afterward (370) with the Persians, who were desirous of possessing themselves of Armenia, and though the two powers came frequently into collision, the one as the assailant, and the other as the ally of the Armenian monarch, war was not declared till the end of 372, when the Romans were victorious. Valens, who had removed to Antioch at the commencement of the war, now occupied himself with the religious quarrels between the Arians and the orthodox party, which at that time raged with much violence over the whole eastern empire. Incapable of independent judgment, he had adopted the views of his Arian councilors, and under their guidance, punished the more obstinate of the "heretics." At the same time, a conspiracy, prompted by professors of magical arts, who declared that Valens's successor should be one whose name began with *Theod*, was discovered, its promoters and agents punished with death, as well as a number of persons who were so unfortunate as to possess a name commencing with the unlucky prefix. Affairs on the eastern frontier again assumed a threatening aspect; but the Romans were disinclined any longer to interfere with the designs of the Persians on Armenia, and concluded a somewhat discreditable treaty in 376. In the mean time, events were taking place on the northern frontier which were destined ere long to become of sinister import to the Roman empire. The Goths, who had for some time been peacefully settled in Dacia, were assailed by the advancing hordes of the Huns; the Ostrogoths, who first felt the shock, were partly incorporated, and the remainder forced to retreat; the Visigoths next attempted to stem the torrent, but without success, and immense crowds of fugitives belonging to this warlike race crowded to the n. bank of the Danube. Valens accorded permission to a large body of Goths under Fritigern to cross into Mœsia and Thrace, and take possession of the waste lands in these provinces; the fugitive Ostrogoths soon afterward crossed the river without permission; and the alarm which the numbers and turbulence of his new subjects speedily aroused led Valens to the adoption of such impolitic measures, that the gratitude of the Goths for shelter afforded was turned to bitter resentment. Valens, prompted by his servile and flattering advisers, at last resolved on war; and marching against the barbarians, he engaged them near Adrianople, Aug. 9, 378. His

army was totally routed, and two-thirds of it, including Valens himself and most of his chief officers, left dead on the field.—See Gibbon's *Decline and Fall*, chaps. 25 and 26; Tillemont's *Histoire des Empereurs*, vol. v.

VALENTINE, Basil, a celebrated German alchemist, of whom so little is known that it has been disputed whether he flourished in the 12th or the 15th century. It has been maintained that he was a monk of the order of St. Benedict, in St. Peter's convent at Erfurt, but his name does not appear on the list at Erfurt, nor on the general list kept at Rome. It seems probable that he flourished about the end of the 15th century. He was a diligent seeker for the philosopher's stone, and wrote a large number of works, chiefly on the process of transmutation, a complete list of which will be seen in Lenglet's *History of the Hermetic Philosophy*, vol. iii. Some of the titles are curious, as *Basil Valentine's Twelve Keys of Philosophy; Apocalypsis Chymica; Revelation of the Mystery of the Essential Colors of the Seven Metals; The Triumphal Car of Antimony; A Chemico-philosophical Tract concerning Things Natural and Preternatural*, etc. After his death, his works were thought to be wholly lost, when they were discovered in the stonework of the abbey, "heaven itself conspiring to bring to light these extraordinary works by shattering by a thunderbolt the pillar in which they were concealed," if we are to believe his followers in the mystic art, who have handed the story down to us. His works were mostly written in the old Upper-Saxon dialect, and were not printed till 1602; after which time many of them were published in the form of French translations, though a few still remain in MS.

VALENTINE'S DAY, the 14th of February, is, or more correctly was, celebrated in England, Scotland, and in different parts of the continent, particularly Lorraine and Maine in France, by a very peculiar and amusing custom. On the eve of St. Valentine, a number of young folk—maids and bachelors—would assemble together, and inscribe upon little billets the names of an equal number of maids and bachelors of their acquaintance, throw the whole into a receptacle of some sort, and then draw them lottery-wise—care, of course, being taken that each should draw one of the opposite sex. The person thus drawn became one's valentine. Of course, besides having got a valentine for one's self, one became, by the universality of the practice, some other person's valentine; but, as Misson, a learned traveler in the early part of last century, remarks, "the man stuck faster to the valentine that had fallen to him, than to her to whom he had fallen." These imaginary engagements, as may readily be supposed, often led to real ones; because one necessary consequence of them was that, for a whole year, a bachelor remained bound to the service of his valentine, somewhat after the fashion of a mediæval knight of romance to his lady-love. At one period it was customary for both sexes to make each other presents, but latterly the obligation seems to have been restricted to young men. During the 15th c. this amusement was very popular among the upper classes, and at many European courts. From Pepys's *Diary*, we see that in Charles II.'s reign, married as well as single people could be chosen.

For some time back, the festival—at least in England and America—has ceased to possess the graceful symbolic meaning it used to have, and has become a considerable nuisance. The approach of the day is now heralded by the appearance in the stationers' shop-windows of vast numbers of missives calculated for use on this occasion, each generally consisting of a single sheet of paper of the cheapest kind, on which is seen some ridiculous-colored caricature of the male or female figure, with a few burlesque verses below. More rarely, the print is of a sentimental kind, such as a view of Hymen's altar, with a pair undergoing initiation into wedded happiness before it, while Cupid flutters above, and hearts transfixed with his darts decorate the corners. Maid-servants and young fellows interchange such epistles with each other on the 14th of February, no doubt conceiving that the joke is amazingly good; and, generally, the newspapers do not fail to record that the city postmen delivered so many hundred thousand more valentines on that day than they do in general.

The connection of the custom with St. Valentine is purely accidental. In the legends of the different saints of that name recorded in the *Acta Sanctorum*, no trace of the practice peculiar to the 14th of February is found. It has been suggested by Mr. Douce, in his *Illustrations of Shakespeare*, that the custom may have descended to us from the ancient Romans, who, during the *Lupercalia*, celebrated in the month of February, were wont, among other things, "to put the names of young women into a box, from which they were drawn by the men as chance directed;" and that the Christian clergy, finding it difficult or impossible to extirpate this pagan practice, gave it at least a religious aspect by substituting the names of particular saints for those of the women; and it is certainly a usage more or less widely extended in the Roman Catholic church to select, either on St. Valentine's day or some other, a patron saint for the year, who is termed a valentine. But it is far more probable that the custom of choosing valentines is a relic of that nature-religion which was undoubtedly the primitive form of religion in n.w. Europe—as elsewhere; and that it sprung from a recognition of the peculiarity of the season. Hence the explanation, that "about this time of the year the birds choose their mates, and thence probably came the custom of the young men and maidens choosing valentines or special loving friends on that day." Valentines are now less extensively manufactured than formerly.

VALENTINIANS, a gnostic sect or school (see GNOSTICS), founded by Valentinus, who went from Alexandria to Rome about 140 A.D., and died there, or in Cyprus, about 160. The distinguishing feature of his system lies, in the first place, in his recognizing heathenism as a preparatory stage of Christianity; and then in his dividing the higher spiritual world into 15 pair of æons, each consisting of a male and a female. The first pair, or syzygy, is made up of Bythos, or God in himself, and Ennoia, or God as existing in his own thoughts; from these emanated next Nous (Intelligence) and Aletheia (Truth), and so on. As the last æon, Sophia, transgressed the bounds that had been laid down by the æon Heros, and a part of her being became lost in Chaos, there was formed a crude being, called Achanroth, which, through the Demiurgos that emanated from it, created the corporeal world. Heros now imparted to the souls of men (for all the bodies composing the corporeal world are possessed of souls) a *pneumatic* or spiritual element, but this only attained to full activity when Christ, a collective emanation from all the æons, appeared as Saviour, and united himself with the man Jesus. In the end, all that is pneumatic, and even the originally psychic or soul element in as far as it has assimilated itself to the psychic, will return into the Pleroma.

VALENTINIA'NUS, the name of three Roman emperors of the same family; the first and most famous of whom, VALENTINIANUS I., was the son of a Gratianus (a ropemaker who had enlisted in the army, and risen to the grade of *comes militum*), and was born at Cibalis, in Pannonia, 321 A.D. Valentinianus entered the army at an early age, and, aided by the military renown of his father, rapidly rose in rank under the emperors Constantius and Julian, only, however, to fall more rapidly; for he was degraded by Constantius in 357, and, for his publicly expressed contempt for paganism, banished by Julian in 362. Restored to favor in the following year, he distinguished himself in the e., and on the death of Jovian, was unanimously chosen as his successor, Feb. 26, 364. A month after his accession, he chose as his colleague his brother, Valens (q.v.), to whom he resigned the government of the e., reserving for himself Illyricum, Italy, the Gauls, Britain, Spain, and Africa. During VALENTINIANUS's reign, the utmost vigilance was required to preserve the frontier districts of the empire from the ravages of the swarms of barbarians who, like vultures, had gathered round their prey, watching with greedy eagerness the rapid decay of its strength, and ready at the first opportunity to hasten its impending doom. The Alemanni repeatedly (366–68) ravaged the e., and the Saxons (370) the north-east of Gaul; Illyricum was wasted (370) by the Quadi, and Africa by the southern desert tribes; and though these invasions were mostly repelled and revenged in a manner becoming the warriors of the queen of nations, the auxiliary means often had recourse to (e.g., the assassination of two powerful and able opponents, the kings of the Alemanni and Quadi, and the treacherous attack on the Saxons while under the fancied security of a treaty), surely indicated that the sturdy virtue which formerly imbued the soldiers of the empire was rapidly disappearing. The internal administration was excellent, for the emperor added to his ability, prudence, and firmness of character, the less common imperial qualities of vigilance and impartiality; and his cognizance of any abuse or injustice by whomsoever perpetrated, was the signal for its speedy rectification, and the severe punishment of the offender. Though himself a zealous Catholic, he repelled the solicitations of the bishops who wished him to interfere in the religious disputes of the time, permitted his subjects to adopt whatever religion they chose, and strictly forbade all persecution or annoyance on account of religious belief, even retaining the "pontifices" of the provinces in the privileges which they had possessed under Julian. On account of the scandalous abuse by ecclesiastics of their influence over their penitents, he excluded priests and monks from the right of succession to property; judicial proceedings were forbidden to be held in private; the extreme license of speech hitherto allowed to advocates was judiciously restrained; gratuitous medical attendance was provided for the poor of Rome; and schools were established throughout the empire. The success of VALENTINIANUS's administration was doubtless much owing to his fortunate choice of officers: Theodosius the elder in Africa and Britain, Jovinus in Gaul, and Theodosius the younger (afterward emperor) in Illyricum, form a trio distinguished by an unswerving loyalty, administrative ability, and miltary talent, rarely found in any age; and contrast strongly with their predecessors in office. VALENTINIANUS's private life was a model of morality and economy; and according to the summation of the accurate and trustworthy Ammianus, "he had so many good qualities, that if everything had been equal in him, he would have been another Trajan or Marcus Aurelius." But the one and grievous fault which marred his character was an ungovernable temper, which led him into the occasional commission of excessive cruelties, and ultimately caused his death; for while giving audience to the deputies of the Quadi, with whom he was then at war, he worked himself into such an access of passion as to rupture a blood-vessel in his chest, and fell back dead into the arms of his guards, Nov. 17, 375. By his first wife he had one son, Gratianus (q.v.); and by the second, Justina, another son, Valentinian, and three daughters, one of whom, Galla, became the wife of the emperor Theodosius I.—VALENTINIANUS II., the younger son of the preceding, was born 372 A.D., and received from his elder brother, Gratianus (q.v.), the provinces of Italy, Illyricum, and Africa, as his share of the western empire. During his long minority, the empress Justina,

administered the government; and about three years after her death, Valentinianus, who had given promise of good administrative qualities was murdered by the Frank, Arbogastes, the commander-in-chief of his army, May 15, 392.—VALENTINIANUS III., the grand-nephew of the preceding, being the son of Constantius III. by Placidia, the daughter of Theodosius the great and Galla, was born about 419 A.D. and was seated on the throne of the west by Theodosius II., emperor of the east, 425 A.D. Valentinianus was a weak and contemptible prince, nevertheless his reign is one of the most interesting epochs of Roman history, exhibiting, as it does to the full, the internal weakness and corruption of the empire, the gradual closing with it of its irresistible barbarian foes; the sad picture being momentarily lightened from time to time with a flash of the warrior-spirit of old Rome. Valentinianus may be said never to have ruled during the 30 years that he sat disesteemed and unhonored on the imperial throne; his mother, Placidia, governed till her death in 450, and was succeeded by the eunuch, Heraclius, one of those malignant fribbles who swarmed around the throne of the falling empire. The regulations enacted for the internal administration were creditable, and especially so when ecclesiastical interests were involved, as in almost all cases, the ambitious and persecuting tendencies of the now preponderant orthodox party, were firmly restrained; while, on the other hand, the fierce vindictiveness of its more bigoted rivals was kept within bounds. But the utter corruption of manners, the complete extinction of "public spirit," the oppressive exactions of the tax collectors, and equally of the commissioners who were appointed to prevent these exactions; the general employment of the powers of the executive in the avenging of private quarrels, and the utter impossibility of obtaining redress for injuries, too plainly showed that the empire had fallen far beyond remedy, and that if not destroyed by assailants from without, it would speedily crumble to pieces of itself. The early part of Valentinianus's reign was disturbed by the contests between the "comites" Boniface and Aëtius, the former of whom had supported, and the latter resisted Valentinianus's claims to the throne; but notwithstanding this, the vile and groundless calumnies of Aëtius prevailed upon the empress to declare the gallant and upright governor of Africa a public enemy; and the latter, in the first flush of resentment, called to his aid the Vandals under Genseric (q.v.). Thus Africa was lost to the empire. But Aëtius, notwithstanding, proved himself the invincible bulwark of the Roman power in Europe; the Franks, Goths, Burgundians, and other German nations who had encroached on the empire, were successively defeated and repelled, and the destructive career of the formidable Huns brought nigh to a close on the field of Chalons. Yet the labor of defending an extensive empire from attack on all sides was too much for one man; and consequently, much of Spain and Gaul was ultimately seized by the Suevi and Visigoths, the n. of Italy was ravaged by the Huns, Sicily and Sardinia by the Vandals, and even Rome repeatedly besieged, while Britain was abandoned to the wild Picts and Scots. Aëtius seems to have committed the same error as his more upright and noble, though not more able, predecessor Stilicho (q.v.), in attempting, by the marriage of his son to Valentinianus's daughter, to transfer the imperial dignity to his own family, and like him also, undermined in influence and reputation by the machinations of a eunuch, he was assassinated, though by the sword of his master (454). In the following year, Valentinianus was conspired against by the friends of Maximus and the faithful adherents of Aëtius, and murdered, March 16.

VALENZA, *Valentia, Valentinum Forum*, a city of northern Italy, province of Alessandria, on the right bank of the Po, 9 m. n. of Alessandria. It is very regularly built, and commands a fine view of the surrounding vine-clad hills. It carries on a trade in wine, and manufactures of silk, flax, and hemp fabrics. Pop. abt. 6500.

VALERA JUAN, Spanish novelist and diplomat, was born in the province of Cordova, Oct. 18, 1824. After a thorough education, his aristocratic connections enabled him to embrace a diplomatic career. *Pepita Jiminez*, his first novel, appeared in 1874, and "was a success unparalleled in the history of modern Spanish literature." It has been translated into English. Among his later novels are *El Comendador Mendoza*, *Doña Luz* and *Doctor Faustino*. Valera has also produced many excellent critical studies. For several years he represented Spain in Washington and elsewhere, subsequently becoming a senator and member of the council of state. In 1893 the Pope declined to receive him as the envoy of Spain at the Vatican because of his *Pepita Jiminez*.

VALE'RIAN, *Valeriana*, a genus of plants of the natural order of *valerianaceæ*, an order of exogenous plants, containing nearly 200 known species, natives of temperate climates, chiefly of Europe, the mountainous parts of India, and South America; annual or perennial herbaceous plants with opposite leaves, destitute of stipules, and small flowers in cymes. They are nearly allied to *dipsacaceæ* (see TEASEL), but differ in the mode of inflorescence, and in the seeds being destitute of albumen. The fruit also is not simply 1-celled, but exhibits two other abortive cells, and the stamens are 1–5, the stigmas 1–3. The corolla is sometimes spurred.—The genus *valeriana* is distinguished by a pappus-like calyx, a spurless corolla, and three stamens. The species are pretty numerous. The common valerian (*V. officinalis*) is abundant in ditches, moist woods, etc., in Britain and throughout Europe. It has a fleshy root, pinnatifid leaves, a stem 2–4 ft. high, and pale flesh-colored flowers. The root is a well-known medicine, used both by physicians and as a domestic remedy in spasms, epilepsy, hysteria, and other nervous affections. It possesses powerful antispasmodic properties, and a very considerable influence over the nervous system. Cats are very fond of it, and it exercises a

remarkable stimulating and intoxicating power over them. Although the plant grows chiefly in damp soils, the root is most powerfully medicinal in dry hilly ground.

The roots should be collected in autumn; and those from wild plants growing on a dry soil are preferred. The chief ingredients of valerian are woody fiber, resinous and gum-like matters, and a little more than one per cent of a volatile oil, which is crystallizable, and has been termed *valerole*, and in which a well-known acid (also obtained from several other sources), *valerianic* or *valeric acid*, is developed on exposure to the air. Valerian imparts its therapeutic properties, which are those of a stimulating antispasmodic agent, both to water and to alcohol. There are three officinal preparations—viz., the *infusion*, the *tincture*, and the *ammoniated tincture*. In large doses, valerian produces considerable disturbance of the nervous system, as headache, vertigo, and even temporary blindness. In average doses—as, for example, in from one to two ounces of infusion, and from half a dram to two drams of either of the tinctures—it is a very efficacious remedy in those severe cases of hysteria which closely simulate epilepsy, and in chorea. As some of the salts of valerianic acid—viz., the valerianates of soda, zinc, ammonia, iron, and quinine—act similarly to and with more certainty than the above-named preparations, we may infer that the therapeutic action of the remedy is solely due to the acid; and as the infusion and tinctures are by no means agreeable medicines, they will probably soon be replaced by the valerianates.

The Small Marsh Valerian (*V. dioica*), also a native of Britain, is much less powerful than the common species.—The greater valerian (*V. phu*), which grows in alpine districts of the continent of Europe, is now almost entirely disused, although it is said to be one of the strongest of the European valerians, a pre-eminence which *V. dioscoridis* disputes with it.—*V. Celtica* and *V. saluinca* are gathered near the limits of perpetual snow on the mountains of Styria and Carinthia, and carried into Turkey and Egypt, and thence into India and Ethiopia, to be used to aromatize baths, and as a substitute for Spikenard (q.v.).—*V. sitchensis*, a native of the n.w. of America, is said to possess the medicinal properties of the genus in great perfection. *V. Hardwickii* is used medicinally in Nepaul.—The root of *V. edulis*, a species found in the n.w. of America, is an article of food of the Indians.—Corn salad (q.v.) or lamb's lettuce belongs to the order *valerianaceæ*.

VALERIANEL'LA. See Corn Salad.

VALERIA'NIC or Valeric **ACID** is one of the volatile fatty acids represented by the general formula $C_nH_{2n+1}\cdot CO_2H$, or $C_nH_{2n}O_2$. Its composition is represented by the formula $C_4H_9\cdot CO_2H$; and among its chief properties it may be noticed that it is a limpid, colorless, oily fluid of a penetrating odor, allied to that of valerian root, and an acrid taste. It renders paper transparent, but the spots disappear on exposure to the air. Its specific gravity is 0.94, it boils at 347° F. (175° C.), and may be distilled without change; and its vapor is inflammable. It is only slightly soluble in water, but dissolves in alcohol and ether in all proportions. It exists in and is obtained by distilling valerian root with water acidulated with sulphuric acid. It may be similarly obtained from angelica root, and some other vegetable sources. It is also formed during the oxidation of fats and fatty acids (especially oleic acid), either by nitric acid or mere exposnre to the air, by the oxidation and putrefaction of the albuminates, etc., but the best method of procuring it is by distilling a mixture of amylic alcohol (or fusel oil) with bichromate of potash and sulphuric acid.

The salts of valerianic acid—the valerianates or valerates, as it is now becoming the fashion to call them—are formed either by saturating the base or its carbonate with the free acid, or by double decomposition, their general formula being $C_5H_9O_2\cdot M$, when M is any metal. The alkaline valerianates are very soluble, and are not easily obtained in crystals; but most of the other salts occur in nacreous scales, and all of them, when moist, have the smell and taste of valerian.

The following salts are used in medicine: *valerianate of soda*, which is included in *pharm. Br.* *valerianate of zinc*, which is also included in *pharm. Br.*, and occurs in brilliant white pearly tabular crystals, with a feeble odor of valerianic acid and a metallic taste, is scarcely soluble in cold water or in ether, but insoluble in hot water and alcohol. Besides these officinal salts, the valerianates of ammonia, of iron, and of quinia are employed in the same cases as the preparations of valerian, the doses averaging from half a grain to three or four times that amount three times a day in pills, except in the case of the ammonia salt, which is best given in solution. *Amyl valerianate*, $C_5H_{11}\cdot C_5H_9O_2$, is a volatile fluid with a penetrating odor of apples, boiling at about 374° F. (190° C.), slightly soluble in water, but dissolving freely in spirit and in ether. In the form of a dilute spirituous solution, it so strongly resembles apples in its smell that it is used in perfumery under the title of *oil of apples*.

VALERIA'NUS, P. Licinius, Roman emperor, was descended from an ancient and noble family, and after distinguishing himself in the various posts which he was selected to fill by masters who appreciated his talents and virtues, was chosen for his integrity and accomplishments to the office of censor. Faithful in his allegiance to Gallus, he went to summon the legions of Gaul and Germany to aid the feeble emperor against the usurper Æmilianus, but arrived too late to save his master. The usurper's troops, awed by the superior numbers of Valerianus's army, and the stern sanctity of their leader's

character, murdered their own chief, and united with their late antagonists in proclaiming Valerianus emperor, 253 A.D. Valerianus was then about 60 years of age, and feeling his inability to sustain, unaided, the cares of empire, assumed as colleague his eldest son, Gallienus (q.v.). Valerianus showed abundant proof during his short reign of most ardent zeal for the prosperity of the empire; but the times required a ruler of more energy and ability; as the grave disturbances which arose throughout the empire, the irresistible irruption of the Franks into Gaul, despite the utmost efforts of Aurelianus (q.v.), the devastation of Thrace, Macedonia, Greece, and the archipelago by the Goths, the advance of the Alemanni to Milan, and the conquest of Syria and Armenia by Shapur, amply testified. The troubles in the e. appearing most threatening, Valerianus went thither in person, and for some time fortune favored his standard; but pursuing his opponents too rashly, he was suddenly attacked by superior numbers at Edessa, completely defeated, and himself, with the remnant of his army, forced to surrender, 260 A.D. The statements regarding the indignities heaped upon the unfortunate captive by his haughty conquerer, are probably false, or, at least, much exaggerated; but of one thing we are assured, that Valerianus languished till death in hopeless captivity; and after his death, his skin was flayed off, stuffed, preserved as a proud trophy of victory, which was invariably exhibited to the ambassadors from Rome to the Sassanide court.

VALERIEN, MONT, is an eminence west of Paris, rising some 350 feet above the Seine, and crowned by one of the strongest of the fortifications of the city. Mont Valerien was a most important factor in the sieges of Paris, during the Franco-Prussian War. This eminence was formerly the site of a monastery, known as Le Calvaire, that was erected during the reign of Louis XIII., and was a favorite resort for pilgrims. Whittier refers to this eminence in his poem entitled *The Chapel of the Hermits.*

VALERIUS MAXIMUS, a Roman historical compiler of the reign of Tiberius, his work bearing the title of *Factorum et Dictorum Memorabilium,* Libri IX, and consisting of short stories and anecdotes from various authors. His style is ornate and often obscure, and his want of acquaintance with the history and constitution of his country renders him an unsafe guide; yet he was a favorite author of his own time, and much studied in the middle ages. The best edition is that of Kempf, Leipsic, 1888.

VALET'TA, an important fortress and beautiful city, capital of the island of Malta, on the n.e. side of which, in lat. 35° 53′, long. 14° 31′, it is situated. It occupies a tongue of land, which runs out in a n.e. direction, is 3,200 yards long, and generally about 1200 yards across, except at the extremity, where it narrows considerably, and forms the famous point of St. Elmo, on which are a powerful fort and a light-house. From this point to its landward end, the neck of land, which is well named the "Hog's Back," rises gradually; and there is a downward slope from the central ridge to the Great harbor on the right, and to the Marsa-Musceit, the quarantine harbor, on the left. Eight principal streets traverse the peninsula, and are intersected by cross-streets, that pass ever the central ridge, and afford communication from harbor to harbor. These cross-streets are necessarily very steep at the extremities, where they rise from the shores by long flights of stairs. The town and harbors are defended by a series of fortifications of great strength. They are mostly hewn out of the solid rock, and, mounted with the most powerful artillery, are considered impregnable. Besides the enormous forts, balconies, and battlements, which are the principal architectural characteristics of the city, Valetta contains many noble edifices. The governor's palace—formerly that of the grand masters—is unadorned without, but magnificent within, and possesses an interesting armory; the cathedral of St. John is a superb structure. There are also a university and a library, founded by the knights. Pop. '91, with suburbs, 62,152. See MALTA.

VALETTE, JOHN PARISOT DE LA, a grand master of the knights of St. John, celebrated for his gallant defense of Malta against a powerful fleet of the Turks, which must be regarded as mainly instrumental in checking the westward progress of the arms of Solyman the great, long the terror of Europe and of Christendom. La Valette was born of a noble family, in 1494; and at a very early age entered the order of St. John, in which he soon distinguished himself by his enthusiastic bravery and his skill in arms. His chief distinctions, even in youth, were won in the naval service in the Mediterranean, where the Turkish power was especially formidable. On the death of Claude la Sangle, grand master of the order, La Valette was elected to that office, being the 48th in the list of the grand masters. Still directing the energies of the order in the same course, he succeeded, within the first five years of his grand-mastership, in capturing 50 great galleys from the Turks, and an immense number of smaller vessels of war; a success which so stirred the indignation of the sultan, that he resolved on the capture of Malta, and the destruction of the knights. Accordingly, on May 18, 1565, an immense fleet, of 159 ships, conveying a body of 30,000 janizaries and spahis, appeared off the harbor of Malta, and after failing in several assaults, formally invested the island. Alone and unsupported by any of the Christian powers, the gallant La Valette maintained the fortress under circumstances of extreme difficulty and distress of every kind; and when, all further resistance seeming to be hopeless, he was urged to capitulate, his reply was, that the life of a worn-out soldier of 71 years could not be better spent than in such a service. At last, at the end of four months, and after a loss, it is said, of 20,000 men,

the Turkish fleet was forced to raise the blockade and withdraw from the island. La Valette died three years later, Aug. 21, 1568.—There is another La Valette, a father of the Jesuit society, who obtained a very different sort of notoriety in the latter half of the 18th century. Having engaged, contrary to the prohibition of Benedict XIV., as a trader in the products of the large estates held by the Jesuits in the Philippine islands, and being unable, in consequence of the capture of his ships by an English privateer, to meet his engagements, a suit was commenced in the French courts against the French province of the society, the proceedings in which suit were among the causes which precipitated the expulsion of the society from France, and its eventual suppression by Clement XIV. See Jesuits.

VALGUARNE'RA, a t. of Sicily, in the province of Caltanisetta, 48 m. n.e. of Girgenti, in a mountainous district. Pop. about 11,500.

VALGUS is a term employed in surgery to designate a variety of club-foot (q.v.). The corresponding Latin word signfies "having legs bent outward, bow-legged," and is probably derived from *volvo*, "to turn or twist." As it is an adjective, the substantive, *talipes* (an unclassical word, indicating "weakness of the feet," but in surgical nomenclature signifying "club-foot") must be regarded as understood.

VALHALLA. See Walhalla.

VALLA, Laurentius, one of the first scholars of the renaissance, was b. at Rome in 1407, taught classics in various places in the north of Italy; but in 1443, on account of his assaults on the scholastic philosophy, and his defense of Epicurus, found it advisable to seek protection at Naples from Alfonso V. Here, however, he soon fell under a suspicion of heresy, and was, it is said, dragged for punishment before the inquisition. Aided by the king, he made his escape, and fled to Rome, where Pope Nicholas V. pardoned him, received him into favor, and appointed him papal secretary and canon in the church of St. John Lateran. He died 1457. Valla's Latin translations of Herodotus (Par. 1510) and Thucydides (Lyon, 1543) are admirable, and had a great influence in spreading a knowledge of classic history; but the work that brought him most renown was the *Elegantiæ Latini Sermonis* (6 books; Rome, 1471), which long served as a model in style to Latinists. From 1471 to 1536, no fewer than 59 editions of it appeared. It has passages of noble eloquence in praise of the glorious tongue of Rome, through which one discerns a passionate desire for the unity of Italy—that now attained aspiration of Italian scholars and writers. The *Elegantiæ* is, moreover, full of nice grammatical observations, particularly on synonyms. Valla has also the credit of being the first of the renaissance scholars that used his classical culture in the criticism of the New Testament (*Annotationes in Novum Testamentum*, published by Erasmus). In his *De Donatione Constantini Magni*, he demonstrated the historical groundlessness of the pretended "Donation" of Constantine, and inveighed against the popes for their grasping after temporal power; but this he was forced to retract. A collected edition of Valla's works appeared at Basel in 1543. See Symonds, *The Renaissance in Italy* (Amer. ed. 1881).

VALLADOLID', a famous city of Spain, sometime capital of the whole country, and still capital of the province of the same name (see Castile), stands on a wide, wind-blown plain on the left bank of the Pisuerga, 150 m. n.w. of Madrid by railway. It is 2,100 ft. above sea-level, and has a healthy climate, the air being pure and genial, and the sky generally cloudless. Having been the residence of the court prior to its removal to Madrid at the close of the 16th c , the city contains many large and decayed dwellings; although, with the returning prosperity of the town, new mansions are being erected, and the streets are being paved, enlarged, and multiplied. In the plaza de Campo, the site of famous tournaments, *autos-da-fé*, decapitations, and bull-fights, Napoleon reviewed 35,000 troops. The university, founded in 1346, is attended by about 900 students. The Museo, which contains such of the statues, carvings, and sculptures as could be collected at the suppression of convents in the province, is an elegant building, containing a grand saloon, six rooms filled with pictures, and three with sculptures. Of these treasures, the sculptures are the most valuable, though among the pictures are several by Rubens. The university, long celebrated as a seat of learning, was founded in 1346. Near the palacio real (royal palace), are the remains of two of the noblest Gothic religious edifices in the world, the convent of San Pablo, and the Colegio de San Gregorio, both richly and beautifully decorated, but much damaged by the French soldiery. Valladolid is admirably situated for trade and manufactures. There is abundant water for irrigation, and the surrounding district is remarkably fertile. It communicates with the Atlantic by the Douro, and with the middle and south of Spain by canals and railways. Manufactures are springing up in the city; the soil in the vicinity is being improved by companies instituted for that purpose; and in other respects Valladolid gives tokens of revival. Silk, cotton, and woolen stuffs, jewelry, hats, paper, perfumery, etc., are manufactured, and there are iron foundries. Pop. '87, 62,018.

Valladolid, the *Pincia* of Ptolemy, is first mentioned under its present name in 1072. Charles V. erected many splendid edifices here. About this time Valladolid was the most prosperous city in Spain, containing 100,000 inhabitants. Formerly capital of Castile and Leon, it was still the residence of the kings and the usual resort of foreigners. In 1560 Madrid was declared the only court; and from this time the prosperity of

Valladolid declined. Since 1851 it has been the seat of an archbishop, and has still its university.

VALLADOLID′, a t. of Mexico, in the state of Yucatan, 100 m. s.e. of Merida, stands in the midst of a highly cultivated tract of country. It is the best constructed and the healthiest town in Yucatan, and the seat of cotton manufactures. Pop. about 14,000.

VALLAN′DIGHAM, Clement Laird, 1820-71; b. Ohio, of Huguenot ancestry; spent a year at Jefferson college, Ohio; principal two years of an academy in Maryland; admitted to the bar, 1842; member of the legislature, 1845–46; editor of Dayton *Inquirer* 1847–49; member of congress, 1857–63; bitterly assailed the measures of government for the suppression of the civil war; was arrested by order of Gen. Burnside; tried by court-martial, and sentenced to close confinement during the war; but the sentence was commuted by President Lincoln to banishment beyond the lines of the army. He escaped to Canada, was nominated governor of Ohio by the democratic party, but was defeated by 100,000 votes; was a delegate to the Chicago convention, 1864. He died by the accidental discharge of a pistol in his own hand.

VALLE, Pietro della, 1586–1652, an Italian traveler, was b. in Rome, but removed to Naples in 1614 and started on a journey to the orient, visiting Turkey, Egypt, Arabia, Persia, and India, where he made a study of the customs and languages of the various people. After eleven years of wandering he returned to Rome, bringing with him many trophies of his journey. He left an account of his travels, which was published at Rome in 1650–58.

VALLE DI RENDENA, a picturesque valley in southern Tyrol, on the upper Sarca, much visited by travelers for its fine mountain scenery. The Adamello, Brenta, and Presanella groups of the Alps can be viewed, and the way to the Madonna di Campiglio lies through the valley. It is well populated and the inhabitants are engaged in the culture of silk and of mulberry trees, and in the rearing of cattle. Many of them travel as scissors and knife grinders to Austria and Italy.

VALLEJO, a city in Solano co., Cal.; on San Pablo bay and the Southern Pacific railroad; 24 miles n.e. of San Francisco, and directly opposite the U. S. navy yard on Mare island. It has an excellent harbor, accessible to vessels of the largest draught, and is principally engaged in agriculture and manufacturing, the latter including ships, machinery, and terra-cotta work. There are electric lights, national and state banks, orphan asylum, high school, St. Vincent's convent school, public library, daily and weekly newspapers, and large grain-shipping interests. Pop. '90, 6,343.

VALLEY, a hollow tract on the earth's surface between hills or mountains. Valleys are generally parallel to the direction of the ridges of elevated ground; but some are transverse, cutting through the mountain-chain. They have a watercourse at or near their lowest level. The main valley is that which has the river of the drainage-system to which it belongs flowing through it, while the tributary streams which feed this river flow through lateral valleys. The terms upper and lower valley define parts of the same valley, as related to the source or to the mouth of the river which flows through it. In a narrow valley, the river always occupies the lowest part; but in wide valleys, especially in those in which waters run that are largely charged with sediment, the river often builds up a channel for itself, that is higher than the ground at the foot of the hill. The river, in its floods, bears a large amount of mud, which it continues to carry as long as the water is retained within its bed; but whenever it overflows its banks, the velocity is reduced, and the heavier particles, which form the bulk of the sediment, are deposited near the river's course; while, flowing over the surface of the level ground, the finer particles fall to the bottom, until, as it reaches the limits of the valley, the water gradually becomes clearer. The Rhine, the Nile, and indeed almost all great rivers in wide valleys, illustrate this phenomenon. The river seldom flows through the middle of the valley, but is generally nearest to that side where the slope to the high ground is steepest; the opposite side of the main valley presenting a more gradual rise to the mountain summits, supplies the chief lateral valleys and feeding-streams to the river.

The origin of valleys has been a subject of considerable controversy, and this question continues to occupy the attention of geologists. At the time when a universal deluge was used to explain whatever was inexplicable in geology, it was considered to have been the agent which furrowed the earth's surface with valleys; and this opinion was entertained so lately, as to have been advocated by the late Dean Buckland in his *Reliquiæ Diluvianæ*, until Prof. Fleming showed the untenableness of these opinions.

At the present day, geologists are very much divided as to the origin of valleys. Some hold that they are the result of the operation of that internal agency which has, at different periods, so broken the crust of the earth, and changed its surface; while others maintain that various agents now operating more or less favorably in disintegrating and removing the solid materials of the exposed portion of the surface of the earth, produced the inequalities that now exist. There can be no doubt that all these have been active, and that the special advocacy of individual agents, as the sole producers of these phenomena, is the source of error, and the cause of controversy. Each and all have done their part; and in a satisfactory explanation, they must all be taken into account. That internal force has been a principal agent in producing the diversity

of hill and valley, seems beyond doubt. This force acted by raising the surface perpendicularly from below upward; by producing great faults, which presented facilities for the action of running water; or by pushing a portion of the crust forward, so as to produce immense folds, alternating with mountain ranges. The Appalachians of North America, and the associated valleys, have been produced, as has been shown by prof. Rogers, by the last-mentioned method; and the tertiary strata of the Alps were carried up a 1000 ft., while the valley-beds of the Adriatic and the Mediterranean either remained stationary or subsided to a lower level. The fact that some valleys are only the synclinal axes between the bounding mountain systems, like the basin of Switzerland between the elevated ridges of the Alps and the Jura, also confirms the opinion that some valleys owe their origin to the operations of an internal force, which operated in geologic ages in a more powerful manner than it has been known to do in historical times. In the face of such facts, it is surprising to hear practical geologists so influenced by pet theories as to assert that the action of internal force has "no direct effect on the external features of the ground." But this is the position of men who adhere to the strict Lyellian doctrine, that all the past changes on the earth's surface have been produced by agents now operating, and at the same rate, but through enormously protracted periods of time. But as these agents are various, so we have almost as many theories as there are agents. Lyell insists that ocean currents, and the wear and tear of the waves, have produced the inequalities. Jukes will have it that the atmosphere has disintegrated, and the rivers carried off the materials which formerly filled up the hollowed-out valley to a level with the surrounding hills; while Ramsay declares that glaciers were the important agents in the process. While the advocates of superficial agents so completely ignore the influence of internal force, as in the statement of prof. Jukes quoted, those who maintain the opposite view are equally open to condemnation when they declare that "the wear and tear due to atmospheric sub-aërial erosive agency never could, even after operating for countless ages, have originated and deepened any of the valleys which occur in flat countries." — Murchison's address at British Association, 1865.

VALLEY, a co. in central Nebraska, consisting of rolling prairies traversed by branches of the Platte river; 576 sq. m.; pop. '90, 7092, chiefly of American birth. Co. seat, Ord.

VALLEYFIELD, t. and port of entry in Beauharnois co., Quebec, Canada; on the St. Lawrence river, the Beauharnois canal, lake St. Francis, and the Grand Trunk, the Canada Atlantic, and the Adirondack and St. Lawrence railroads; 30 miles s.w. of Montreal. It is the seat of a Roman Catholic bishop, and has a college, convent, hospital, and cotton, paper, and flour mills, electric lights, waterworks, branch banks, excellent water-power, and weekly newspaper. Pop. '91, 5515.

VALLISNE'RIA, a genus of small, stemless, aquatic plants, with grass-like leaves, belonging to the natural order *hydrocharideæ*, and found in the warm parts of both hemispheres. They generally grow in running waters. *V. spiralis* is particularly celebrated on account of its peculiar process of fecundation. At the time when this is to take place, the flowers of the female plants rise to the surface of the water by means of their long spirally-twisted stalks. The flowers of the male plants, in order to follow them thither, become detached, having previously grown on short spikes at the bottom of the water, and expand, floating about upon the surface. After fecundation, the female flowers return under the water by the spiral contraction of their stalks, and the fruit is ripened under water. This plant is found in ditches and bogs in Italy and the s. of France.

VALLOMBRO'SA, a celebrated abbey of Tuscany, situated among the Apennines, in a valley surrounded with forests of fir, beech, and chestnut-trees (hence the name, meaning "shady valley"). Here an order of monks according to the rule of St. Benedict was founded about the middle of the 11th c., who were called Vallombrosians from the name of the site, or gray monks, from the color of their habit, which, however, was afterward changed to black. They were the first to admit lay brethren. The monastery became very wealthy through donations, and the present magnificent buildings were erected in 1637. It formed a refuge for priests during French rule in Italy. After 1815, the monks resumed possession, but in very diminished numbers. In 1863 the monastery was suppressed, and the buildings were made use of for a royal academy of forestry. The monastery and its highly picturesque environs are still much visited by artists and tourists.

Vallombrosa was visited by Dante, celebrated by Ariosto in the *Orlando Furioso*, canto xxii,, and is mentioned by Milton in the *Paradise Lost.*

VALLS, an old-fashioned t. of Spain, in the province of Tarragona, on a hill in the midst of a fertile district watered by the Francoli, 55 m. w. of Barcelona. Valls is surrounded by ancient walls, has manufactures of cotton, linen, brandy, paper, and leather. The French, under St. Cyr, defeated the Spanish here in 1809; but were in their turn defeated in 1811. Pop. '87, 13,274.

VALMORE, MARCELINE FÉLICITÉ JOSÈPHE DESBORDES; 1786–1859; b. Douai, daughter of M. Desbordes, a poor artist; was educated in Guadaloupe; appeared on the stage in France as a singer, and married the actor Valmore, 1817; left the stage and gave herself to literature. Her novels are *Recueil de Poésies*, 3 vols.; *Les Veillées des Antilles*,

2 vols.; *L'atelier d'un Peintre*, 2 vols.; *Le salon de Lady Betty*, 2. vols. Her poems are *Elegies et Romances; Pleurs; Pauvres Fleurs.*

VALMY, a French village in the department of Marne, 36 m. s.e. from Rheims. In 1792, the Prussians, under the duke of Brunswick, after capturing Longwy and Verdun, were advancing toward Paris, driving the army of Dumouriez before them, when Kellermann (q.v.), who commanded the army of the Rhine, learning the critical situation of his comrade, hastened to his relief with 22,000 men, and taking up his position on the heights of Valmy, awaited the advance of the Prussians. These, possessing themselves of the heights of La Lune, immediately opened a vigorous cannonade on the French, to which the latter effectively replied. The explosion of two ammunition wagons within the French lines having thrown them into disorder, a body of Prussians, taking advantage of the confusion, advanced to the attack; but the energetic conduct of Kellermann, and the enthusiasm infused by him into his troops, restored their steadiness, and by a sudden charge with the bayonet, the Prussians were made to retire to their former position. This battle, or skirmish, frequently alluded to as the *cannonade of Valmy*, did not cost either army more than 800 men, but though, in a military point of view, an insignificant affair, it produced moral effects of the greatest importance. It was the first triumph of the republican arms, and with characteristic impulsiveness, the French were transferred from the depths of despair to the very pinnacle of self-confidence. When Napoleon was creating his "noblesse," this great service rendered to France by Kellermann was fitly remembered by his nomination as *duc de Valmy*.

VALOIS, House of, a branch of the Capetian dynasty (q.v.) which possessed the throne of France from 1327 till 1589, originated in the person of Charles, second son of king Philippe III. (*le hardi*), who obtained in 1285 the county of Valois in appanage from his father. Previously, the county of Valois had been possessed by a cadet branch of the great house of Vermandois; but on the union of the heiress of Vermandois with count Hugh the Great, the younger son of king Henry I, and the failure of their descendants in the end of the 12th c., the Vermandois possessions, including Valois, were annexed to the French crown, till again separated in 1285, as above mentioned. But Philippe IV., the elder brother of Charles, having left three sons, who reigned in succession, and died without issue male, the succession fell, by the Salic law, to the eldest son of Charles, who accordingly ascended the throne as Philippe VI. (q.v.). The elevation of the house of Valois to the throne of France gave rise to long and bloody wars with Edward III. of England, who claimed the crown through his mother, Isabel, the daughter of Philippe IV., insisting that the Salic law only prohibited the "succession" of females, and did not deny their capacity for transmitting a claim to the crown. But if Edward III.'s argument had been sound, it would have destroyed his rival's claim without benefiting himself, for the real heirs to the throne would have then been the Navarrese royal family, who were descended from the eldest daughter of Louis X. Edward, nevertheless, assumed the title of *king of France*, an example followed by all his successors till George III., and maintained his claims by force of arms till, by the mediation of the pope, a partition of the kingdom was effected. The French crown fell, by regular succession of son to father, to John the Good (1350–64), Charles V. (1364–80), Charles VI. (1380–1422), Charles VII. (1422–61), Louis XI. (1461–83), and Charles VIII. (1483–98), under the first four of whom the contest with England was carried on with spirit, at first to the advantage of the English, but latterly of the French, who, under Charles VII., succeeded in driving the English from all their strongholds, Calais alone excepted. Charles VIII. having died without leaving male issue the crown fell to the representative of the nearest collateral male line—that is, to Louis, son of Charles, duke of Orleans, and grandson of Louis, duke of Orleans, the younger brother of Charles VI., who ascended the throne as Louis XII. (1498–1515), the first of the Valois-Orleans régime; but he also dying without male issue. the succession devolved upon the descendants of his uncle, count Jean of Angoulême, whose grandson, Francis I (1515–47), next obtained the scepter, which he transmitted to his son, Henry II. (1547–59). Henry's three sons, Francis II. (1559–60), Charles IX. (1560–74), and Henry III. (1574–89), occupied the throne in succession; but none of them leaving lawful male heirs, and all the collateral male lines proceeding from Philippe III. having become extinct, the crown passed to the house of Bourbon (q.v.), which was descended from his younger brother Robert.

The most distinguished cadet branches of the royal line of Valois were, the ducal family of Anjou, which long contested with the Aragonese royal family the possession of Naples; the last and most celebrated ducal house of Burgundy; and the illegitimate line of Dumois and Longueville, which was so productive of eminent warriors and daring politicians.

The Valois monarchs of the elder line were a succession of able rulers, who, by valor and policy, wrested France from the hands of the English, and firmly established the royal authority over their powerful, proud, and turbulent nobility; those of the younger, or *Valois-Orleans* and *Valois-Orleans-Angoulême* lines were, with the single exception of Francis I., a series of weak princes, under whose feeble rule the country was distracted by contests for power between rival nobles, and religious dissensions among the people at large, though, owing to the number of able men on whom devolved the cares of

government, the country suffered less from the incapacity of its monarchs than might have been expected.

VALO'NIA, an article very extensively used by tanners, in consequence of the quantity of tannic acid which it contains. It is the acorn-cup of a species of oak (*quercus ægilops*), indigenous to Asiatic Turkey.

VALPARAI'SO, a province of Chili, bounded e. and s. by Santiago, w. by the Pacific ocean; area, 1637 sq. m.: pop. '94, (est.) 230,990. Surface mountainous, soil in the valleys fertile, producing good crops of cereals, grasses, and fruits. Agriculture is the principal industry. Wine and brandy are made. Mines of silver and copper are worked. The province is divided into the departments of Valparaiso, Quillota, Limache, and Casablanca. The islands of Juan Fernandez belong to this province.

VALPARAI'SO, the most important trading-town of Chili, South America, is situated in the province and on the bay of the same name, about 68 m. w.n.w. of Santiago (q.v.), with which it is connected by railway. It is chiefly built on a narrow strip of land, at the head of the bay. It contains theaters, colleges, hospitals, and a number of scientific and literary institutions; its streets, though narrow, are well paved; and its houses, almost all two stories high, are gaily painted, and furnished with balconies. The picturesque bay of Valparaiso, which is generally crowded with ships, is sheltered from all quarters except the north; and in the winter months, when northern gales prevail, the anchorage is considered dangerous. In 1822, the town was nearly destroyed by an earthquake; and on several occasions since that time, its progress has been checked by the same cause: in spite of this, however, Valparaiso has made great progress within recent years, its population having increased from under 10,000 in 1825, to 150,000 in 1890. Fifteen forts, mostly new, defend the bay. The imports in 1894 were 34,220,651 pesos, being chiefly cotton, silk, and woolen goods, hardware, iron, sugar, wines, spirits, tobacco, etc.; and the exports were 8,361,140 pesos, being chiefly copper and copper ore, silver, gold, wheat, flour, tallow, hides, and wool. Valparaiso was bombarded by the Spanish fleet Mar. 31, 1866.

VALPARAISO, city and co. seat of Porter co., Ind.; on the Chicago and Grand Trunk, the New York, Chicago, and St. Louis, and the Pennsylvania Co.'s railroads; 44 miles s.e. of Chicago. It is the seat of the Northern Indiana normal school; contains St. Paul's academy (R.C.), waterworks on the direct pressure system, electric light plant, national and state banks, and nearly a dozen churches; and has manufactories of machinery, self-winding clocks, and other articles, and several daily, weekly, and monthly periodicals. Pop. '90, 5090.

VALPY, RICHARD, D.D., 1754–1836; b. island of Jersey; educated at the college of Valognes, Normandy, 1764–69, graduated at Oxford, 1776; ordained in the church of England; settled at Bury St. Edmund's; rector of Stradishall, Suffolk, 1787; head master of the school at Reading, founded by Henry VII. He was a successful teacher, and prepared for the school Latin and Greek grammars and text-books which have been much used. His youngest son, the Rev. Frederick E. J. Valpy, who graduated at Cambridge, succeeded him in the school. He published *Etymological Dictionary of the Latin Language; Etymology of Words of the Greek Language in Alphabetical order.*

VALTELLI'NA, a valley of Lombardy, province of Sondrio, bounded n. by the Swiss canton of Grisons, n.e. by Tyrol, s. by the province of Brescia, Bergamo, and Como, w. by lake Como and the valley of Chiavenna. It is 45 m. long. It now forms the Italian province of Sondrio. It is very fertile, producing wine, grain, fruit, and cheese. This and the two valleys of Bormio and Chiavenna belonged to the dukes of Milan in the middle ages; became part of Grisons, 1512, and continued in possession of the Swiss, successfully resisting the efforts of Austria through the 30 years' war to get it; became part of the French department of Adda in 1804; came under Austria, 1814, as a part of Sondrio; and in 1859 became subject to Italy.

VALUE has been defined as the measure of the sacrifice involved in obtaining utility. Another and simpler definition is: value is the measure of utility. Both of these definitions are given by recent economists who have become dissatisfied with the distinction made by the older school of economists between value in use and value in exchange. It was formerly held that the science of economics had nothing to do with the former of these concepts, but only with value viewed as exchange power, i.e., that quality in a commodity which confers on its possessor a command over a certain portion of the stock of useful or desirable things. The truth is, the term value is used in several different senses. We may mean by it the power of the thing to satisfy a human want, as when we speak of a valuable improvement, or a valuable contribution to literature. Or we may mean the purchasing power of an article in the abstract, or again its purchasing power in commodities instead of in money. Owing to these different acceptations of the word and its frequent employment in different senses during the same course of reasoning, there has arisen great confusion in regard to its real signification. The older economists, by viewing value merely as power in exchange, appeared to simplify the conception, but in reality gave it too narrow limits. Their view appeared to disregard the subjective origin of value, and the fact that its degree depended upon the sacrifice which it is necessary to make in order to obtain the article which has this quality. In Austria, in recent years, several economists have applied themselves to the study of the pheno-

mena of value with the result of revolutionizing the economic views on the subject. In the United States, Prof. John B. Clark, in his *Philosophy of Wealth*, published in 1887, also took a decided stand against the older definitions. "Value and utility are," says he, "as inseparable as a measure and that which is measured. The conception of linear extension could be as logically separated from the conception of a geographical mile as the idea of utility from that of value."

To pass from the theoretical to the more practical side of the subject, the approximate cause of the value of an article at any time is the relation between the demand and the supply. The distinction between value and price is the distinction between a measure in general, and the number of units of measure by which the size of a specific thing may be expressed. Price is value expressed in terms of some one commodity. We may speak of the value of a pair of shoes as equivalent to the value of two bushels of wheat. The wheat price of the shoes is two bushels. But the ordinary expression of price is in terms of the medium of exchange, i.e., money. As to the value of money, it is determined in the same way as the value of any other commodity, viz. first, by the sacrifice which it is necessary to make in order to obtain it, and in a secondary way by the operation of the law of supply and demand. For a brief description of the Quantity Theory, see the article MONEY. As to the relation between the cost of production and value, it need only be said that value tends in the long run to conform to the cost of production, since the cost of production is in a sense the measure of the sacrifice which it is necessary to make in order to obtain it. Yet it is not the original cost of production which necessarily determines value, but the cost of production at the time at which the article is offered for sale. For instance, a machine which on account of improved processes can now be produced more cheaply than before, will not command a price commensurate with its original cost of production.

When the value of an article closely approximates its cost of production, it is called normal value. The reason why the cost of production tends in the long run to determine the value is the fact that competition tends to raise or to lower value whenever it is below or above the point at which the labor and capital engaged in production receives a fair remuneration. For instance, if the value of an article were so great that those engaged in its production derived an unusual profit, there would be a tendency for additional labor and capital to embark in the industry, and, by increasing the supply, lower the value to a point at which the profits reached the general level. On the other hand, if for any reason the value of an article was below the general level of profits in other lines of production, there would be a tendency for the labor and the capital to flow from the less productive into the more productive channels, and by decreasing the supply raise the value of that commodity. Thus the fact implied in the use of the term normal value is nothing but an application of the familiar principle that labor and capital seek their most productive channels. Nevertheless there are many influences which tend to widen the difference between the actual value of an article and its cost of production. In the first place the existence of plant may prevent the free flow of labor and capital in response to the higher profits afforded in some other business. A capitalist employer may prefer to go on selling temporarily at a loss rather than sacrifice his entire plant by suddenly throwing it on the market. Secondly, the existence of stock is apt to cause a divergence between the actual cost of production and the market value of the thing produced. A good illustration of this is the grain crop. The actual value of a bushel of grain at any one time is determined by the amount offered for sale and the amount which consumers are willing to take; but the amount offered for sale at any one time is not the entire stock on hand. Sellers retain a part in the hope of a future rise of price. Thus an element of speculation enters into the question. Moreover, the grain cannot be obtained in all seasons of the year, and producers are not always able to avail themselves of the high prices which scarcity may cause. Anything that thwarts the free action of competition tends to increase the difference between market and normal value. Custom may influence a consumer to pay more for an article than the price for which he could obtain it if he changed his dealer. On the other hand, a dealer may be influenced by custom to sell for a lower price, under certain circumstances, than he could really command. As the industrial system becomes more complicated, there is a greater liability for serious mistakes in production to arise. The producer and the consumer are further separated, and an over-production in certain lines of industry is likely to occur. When it does occur it is obvious that the producer may have to sell at a price which is insufficient to cover the cost of production.

It remains to say a few words on the subject of final or marginal utility. This term means the utility of an article to a purchaser who is just willing to take it at the existing price. It is obvious that in the consumption of goods, as the point of satiety is neared, the desire for the goods diminishes. For instance, a certain amount of bread may represent to a man the means of appeasing the pangs of extreme hunger, but, with each addition to the quantity in his possession, the point of indifference to further purchases is approached. The price which he is just willing to pay for a piece of bread measures to him its final or marginal utility. The price which any article commands in the market will measure this final or marginal utility to some of its purchasers. These, if the price were higher, would refuse to take the article, but there are others who would be willing to pay more rather than to do without. The net gain to the latter, that is the difference between what they are willing to pay and what they actually do

pay, is called by recent economists *consumers' rents.* In like manner, certain sellers would not produce at all if the price were lower, while others could afford to sell at the lower price. The net gain to the latter is termed *producers' rents.*

The principle that effective demand diminishes with the satisfaction of human wants has been investigated, statistically, by Dr. Engel, who, after studying the expenditure of incomes for many years, found that as the income of a family increased, the percentage expended for food diminished, the percentage expended for clothing remained about the same; that for rent, fuel, and light quite the same; while the percentage devoted to recreation, health, amusement, and the gratification of social ambitions, through education or otherwise, increased.

VAMBÉRY, ARMINIUS, traveler and philologist, was b. in Hungary in 1832. He was compelled to leave his country after the revolution of 1848, and went to Constantinople, where he devoted himself to studying Oriental languages. In 1861 to 1864 he traveled, in the disguise of a dervish, by routes unknown to Europeans, through the deserts of the Oxus to Khiva, and thence by Bokhara to Samarcand. His position precluded him from making instrumental observations for the purposes of geography, but was eminently favorable to an insight into the customs and language of the peoples visited. On this account, therefore, his *Travels and Adventures in Central Asia*, published at London in 1864, is a very valuable work. His other publications are *Wanderings and Adventures in Persia* (1867); *Sketches of Central Asia* (1868); *History of Bokhara* (1873); *Central Asia and the Anglo-Russian Question* (1874); *Origin of the Magyars* (1882); *Autobiography* (1883); *The Turkish Nation* (1885); *The Story of Hungary* (*Story of the Nations Series*, 1886), etc. For many years he was professor of Oriental languages at the university of Pesth.

VAMBRACED, in heraldry (Fr. *avant-bras*, fore-arm), a term applied to an arm clothed in armor, a dexter arm embowed vambraced proper, the gauntlet holding a sword below the hilt in bend sinister, point downward, argent, hilt and pommel or.

VAMPIRE (Ger. *vampyr*), called also by the Servians *vukodlak*, and by the Wallachians *murony*, is, according to the popular belief of the Slavonic, Romanic, and Greek population of the Lower Danube and the Thessalian peninsula, a blood-sucking ghost. In the mythology of the ancient Greeks, beings of a similar nature existed—the Lamias, beautiful phantom women who, by all sorts of voluptuous delusions, allured youths to them in order to feast on their fresh, young, and pure blood and flesh. And among the Greek Christians there is a belief that the bodies of those who have died in excommunication are kept by the devil in a kind of life; that they go forth from their graves by night and suddenly destroy other men, and also by other means procure food, and thus keep themselves in good condition. They are called Burkolakkă, or Tympanită; and the only way of escaping from their molestation is by digging up their unwashed corpses and burning them, after the removal of the excommunication. The vampire proper is the illegitimate offspring of parents themselves illegitimate, or the troubled spirit of one killed by a vampire. During the day he lies as a corpse, but turned in his grave, with a florid appearance and warm blood, open staring eyes, and skin, hair, and nails still growing. But by night, especially at full moon, he wanders about in the form of a dog, frog, toad, cat, flea, louse, bug, spider, etc., and sucks the blood from living persons by biting them in the back or neck. If a dead person is under suspicion of being a vampire his body is disinterred, and if it is found putrid it is only sprinkled with holy water by the priest; but if it is red and bloody, the devil is driven out, and on re-interring it a stake is driven through the breast, or a nail through the forehead; or it is perhaps burned.

The name vampire has been appropriated to blood-sucking bats. It was erroneously given to bats of the s.e. of Asia and Malayan archipelago, which are really frugivorous. The blood-sucking bats are all South American, and belong to the genus *phyllostoma*, or specter-bat (q.v.), and genera nearly allied to it. The true vampires (*desmodus*) resemble the specter-bats; they have a small bifid membrane on the nose, no tail, and the interfemoral membrane little developed. They have two great projecting, approximate upper incisors, and similar lancet-shaped superior canines, all of which are very sharp-pointed, and arranged to make a triple puncture like that of a leech. There are four bilobiate inferior incisors, the innermost separated by a wide interval; the lower canines are small; there are no true molars, but two false molars in the upper jaw, and three in the lower, of a peculiar form, apparently unfitted for mastication. The intestine is shorter than in any other mammal, and the whole structure seems to indicate that blood is the sole food. In some parts of South America, vampires are very numerous, and domestic animals suffer greatly from their nocturnal attacks. They seem to take advantage of an existing wound, but they can also make one. In some parts of Brazil the rearing of calves is impossible, on account of these bats, and there are districts, chiefly those in which limestone rocks prevail, with numerous caves, in which cattle cannot be profitably kept. Vampires sometimes attack men, when sleeping in the open air; but the stories of their fanning their victims with their wings, whilst they suck their blood, are fabulous.

VAN, a fortified town of Turkey in Asia, capital of a district of the same name, stands near the s.e. shore of lake Van, 145 m. s.e of Erzeroom. The principal public buildings, in addition to the citadel, are the mosques, the Armenian churches, the baths, the caravansaries, and the bazars. Van is always called among the Armenians, Schamiramakert—i.e., town of Semiramis—contains ancient ruins, and cuneal inscriptions are found in which the name Xerxes frequently occurs. In 1896 V. was the scene of severe fighting between the Armenian revolutionists and the Turks, each party accusing the other of being the

aggressor. Many lives were lost, but order was finally restored. Thousands of the Armenians sought and received protection at the foreign consulates in the city. Pop. stated at 30,000.—The *district* of VAN, a territory of Turkish Armenia, has sometimes been a separate pashalik, and sometimes a subordinate division. It has an area of 15,440 sq. m., and a pop. '85, of 376,297. It consists mainly of a lofty basin, surrounded by steep mountains, in the center of which is the lake of Van.—The LAKE OF VAN is a considerable inland sea, 80 m. long and 50 m. in extreme breadth, though the average breadth is not nearly so great, with an area of 1550 sq. m.

VANA'DIUM (symb. V, equiv. 51.2), a rare metal of little practical importance. The name was first given to a substance then believed to be an elementary metal, but which has since proved to be a compound. The discovery of the substance was ascribed by some to Del Rio in 1801, and by others to Sefström in 1830. The last-named chemist found it in a Swedish iron ore, and gave it the name of vanadium, from *Vanadis*, a cognomen of the Scandinavian goddess Freyja. Roscoe has, however, demonstrated that this substance is really a compound of oxygen with a metal, and to this new metal the symbol V is now appropriated. In the light of Roscoe's discovery, the V of the old formula becomes V_2O_2, and the oxides VO, VO_2, and VO_3, become V_2O_3, V_2O_4, and V_2O_5. In very small quantities, vanadium is present in nearly all clays, but its most abundant source is vanadiate of lead, which has been found in Mexico and Chili.

VANBRUGH, Sir JOHN, an eminent architect and dramatist of the 18th c., was the grandson of a Protestant refugee of Ghent, who settled in England during the reign of queen Elizabeth. Vanbrugh is supposed to have been born in Chester (in which city his father was a merchant), in the year 1666, and to have been sent to France for his education. His artistic studies were interrupted for some time by his entering the French army, which, however, he left after attaining the rank of capt. On returning to England he must soon have acquired reputation as an architect; for, in 1695, he was made one of the commissioners for finishing the palace of Greenwich for the purposes of an hospital. His first attempt at play-writing was *The Relapse*. It was brought out at Drury Lane with such success, and obtained such popularity, that Vanbrugh ranked ever after as one of the leading wits and dramatists of his day. About 1697 he wrote his famous comedy, *The Provoked Wife*, for Lincoln's Inn theater, where it was produced with even greater success than that which had attended *The Relapse*. He then, in partnership with Congreve, started a theater in the Haymarket, and there brought out his play, *The Confederacy*. But so ill-suited was this building for speaking in, that not even the brilliant wit and racy humor of the *The Confederacy* could command an audience, and Congreve abandoning the scheme, the theater had to be closed. In 1702 he erected for the earl of Carlisle the noble palace of castle Howard, in Yorkshire; and this led to his being employed as the architect of many mansions for the noble and the wealthy in other parts of the country. His reputation was now such that he was commissioned to erect Blenheim House, which the parliament had voted to the duke of Marlborough; but as no particular fund had been provided for meeting the expenses, and as parliament refused, when applied to, to grant any money for that purpose, the commission was more honorable than lucrative. The queen supplied from her own private purse most of the funds; but after her death this supply was of course stopped. The duke of Marlborough having also died, left a specific fund to be expended in meeting the architect's claims; but the duchess not only refused to pay Vanbrugh his salary, but dismissed him from his office; and the house was completed under some other management, but from the original designs. After a great deal of trouble, Vanbrugh managed to get nearly all the money that was due to him; but ever after was the sworn foe of the duchess of Marlborough. In 1714 he was made comptroller of royal works. Vanbrugh died at Whitehall on March 20, 1726, leaving his well-known and popular drama, *The Provoked Husband*, unfinished. His plays can hardly be said to be popular now, their licentious tone and loose morality preventing their being read to that extent to which the brilliancy of their wit, keenness of their satire, and genuine character of their humor would otherwise entitle them. They want the polish of Congreve's dramas, yet, at the same time, they are not infected with the artificiality, stiffness, and labored brilliancy which disfigures so many of Congreve's best scenes. The interest is well sustained throughout; the characters—such as they are—are real, natural, and racy; the situations striking, and the dialogue brilliant and unflagging. The best edition of them is contained in Leigh Hunt's *Comic Dramatists*, to which is also prefixed an excellent life of Vanbrugh. His architectural works are still among the first of their kind—massive, picturesque, varied in outline, and wonderfully skillful in composition, though a frequent carelessness in the management of details spoils some of his best effects.

VAN BRUNT, HENRY, b. Boston, 1832; educated at Boston Latin school and Harvard university; was distinguished as the architect of Memorial hall, and other buildings at Harvard, the library of the university of Michigan, library of Topeka, Kan., the buildings of the Episcopal theological school at Cambridge, Mass.; the medical school of Harvard univ., Stone hall, conservatory, and other buildings of Wellesley coll. Among the churches designed by him are the First church, Boston; St. Stephen's, Lynn; Grace, New Bedford; and the chapel of Forest Hills cemetery. He was also the architect of the First Nat'l bank of Portland, Me.; the Hildreth building, Lowell, Mass., etc. During the war he served as military secretary on the staff of the admiral commanding the North Atlantic squadron.

VAN BUREN, a co. in n. Arkansas, containing ledges of millstone grit, 998 sq.m.; pop. '90, 8567, chiefly of American birth, incl. colored. Co. seat, Clinton.

VAN BUREN, a co. in s.e. Iowa; 480 sq.m.; pop. '90, 16,253, chiefly of American birth, incl. colored. Co. seat, Keosaugua.

VAN BUREN, a co. in s.w. Michigan, having lake Michigan for its w. boundary; 630 sq.m.; pop. '90, 30,541, chiefly of American birth, with colored. Co. seat, Paw Paw.

VAN BUREN, a co. in e. Tennessee; 322 sq.m; pop. '90, 2863, chiefly of American birth. Co. seat, Spencer.

VAN BUREN, JOHN, 1810–66; b. N. Y.; educated at Yale college, where he graduated in 1828; and having undertaken the study of law, was admitted to practice at the bar in New York in 1830. His father, afterward president, having been appointed, but not confirmed, minister to England, in 1832, he accompanied him as an *attaché* during his brief stay in that country. Returning, he resumed practice, and in 1845 was appointed attorney-general of the state, an office which he held three years. The remainder of his life was spent in his professional business, in which he gained success and reputation. He was genial and agreeable by nature, a wit, and a *bon-vivant;* and became noted for popular oratory, particularly for after-dinner speeches. Died, 1866.

VAN BUREN, MARTIN, 1782–1862; b. N. Y.; a lawyer and politician before he had come of age. In 1812 he was in the state senate; three years later was attorney-general; and after being again state senator, was chosen U. S. senator in 1821. He was re-elected in 1827, but resigned to accept the office of governor of the state. He was elected vice-president in 1832 on the ticket with Andrew Jackson, and was elected president at the close of Jackson's eight years' administration in 1837. His administration was rendered notable by his financial views during the panic which occurred in its first year, and which eventually resulted in the passage of a law establishing the independent treasury system. The influence of the slavery question in politics became virulent at this time, and it was even proposed by a member of the South Carolina delegation in the house of representatives that that state should secede from the union. Mr. Van Buren was defeated for a second term in 1840 by the whig candidate William H. Harrison. In 1844 his name was proposed for nomination, but Mr. Polk was nominated and elected. In 1848 he accepted the nomination of the free-soil party, and his candidacy occasioned the election of Gen. Taylor. He now retired from public life; made a tour in Europe, 1853–55; and died at his birth-place, Kinderhook, Columbia co., N. Y., July 24, 1862. A posthumous work by him was published in 1867, *An Inquiry into the Origin and Course of Political Parties in the United States.*

VANCE, a co. in n. N. Car.; formed 1881; 342 sq. m.; pop. '90, 17,581. Co. seat, Henderson.

VANCE, ZEBULON BAIRD, b. N. C., 1830; spent a year at the university of N. C.; admitted to the bar, 1852; member of the legislature, 1854–58; member of congress, 1858; opposed the secession of his state, but when it was accomplished entered the confederate military service; elected governor while in the army, 1862; re-elected, 1864; elected to the U. S. senate, 1870; re-elected governor, 1876; and re-elected to the U. S. senate, 1879, 1884, and 1890. Died 1894.

VAN CORTLANDT, PHILIP, 1749–1831; b. N. Y.; was a land-surveyor at the age of nineteen; joined the patriot army as lieut.col. at the beginning of the revolutionary war; was appointed col. of 2d N. Y. regiment, 1776; served at the battle of Stillwater and against the frontier Indians, 1778; commanded a regiment of militia under Lafayette, 1780; made brig.gen. for gallantry at Yorktown; was a member of the legislature, 1788–90; of the state convention which adopted the U. S. constitution, 1788; state senator, 1791–94; member of congress, 1793–1809.

VANCOUVER, GEORGE, 1758–98; b. near London; entered the navy, 1771; midshipman with Capt. Cook in his voyages, 1772–75 and 1776–80; made first lieut., 1780, served several years in the West Indies, and returned to England, 1789. A quarrel having arisen between some Englishmen who had settled in Nootka and the Spanish officers who were making a survey of the n.w. coast of America, Vancouver was sent to demand the surrender of Nootka from the Spanish commander. Having obtained the surrender he spent the summers of 1792–94 in surveying the coast as far as Cook's inlet, and the winters in the Sandwich islands. Returning he surveyed part of the w. coast of South America from the island of Chiloe, and arrived in England Oct., 1795. The account of his expedition, which was nearly completed at the time of his death, was published in London (1798) in 3 vols. 4to.

VANCOUVER, city, U. S. military post, and co. seat of Clarke co., Wash.; on the Columbia river; 6 miles n. of Portland, Or. It was founded by the Hudson Bay company in 1828; contains fort Vancouver, the headquarters of the military department of the Columbia, St. James college (R. C.), orphan asylum, hospital, high school, public and school libraries, Masonic temple, electric light and street railroad plants, and national and state banks; and has a U. S. land office, steamboat, ferry, and railroad connections with Portland, large lumber, dairy, and fruit-growing interests, flour, saw, and planing mills, artificial stone works, and other industries. A fine view of Mt. Hood is here presented. Pop. '90, 3545.

VANCOUVER, the largest city of British Columbia, is finely situated on Burrard Inlet, which is a deep indentation into the mountainous coast, thus forming a fine harbor for the largest vessels. All this section was an unbroken wilderness, with a solitary saw-mill near the site of the present town, until 1885, when on account of the fine harbor, it was decided to make this the western terminal of the Canadian Pacific R. R. Settlement was begun at once, but the town was entirely destroyed by fire in 1886. Rebuilding began immediately, and of a much more substantial character. It was incorporated as a city in 1886, and has fine waterworks, gas and electric lights, electric street railroads, several banks, Stanley, East End, and False Creek parks, about a dozen churches, and daily, weekly, and semi-monthly periodicals. It is the judicial seat of New Westminster district. A regular line of steamers ply between Vancouver and Yokohama and Hong-Kong; also a daily line to Victoria, and regular lines to San Francisco and Sitka. Pop. '91, 13,685.

VANCOUVER ISLAND, an island in the Pacific ocean, forming a part of the province of British Columbia in the dominion of Canada. It is bounded on the w. by the Pacific, and on the e. by Queen Charlotte sound, Johnstone strait, Discovery strait, and strait of Georgia, which, taken together, form an open sea-way, separating the island from the mainland. Lat. 48° 20′ to 50° 53′ n., long. 123° to 128° west. It is 278 m. in length, from 40 to 50 m. in average breadth, and is of importance not only for its great natural resources, but also from its geographical position, which gives it, both commercially and in a military point of view, the command of the Pacific. Area, about 16,000 sq. miles. The main mass of the island is a mountain ridge, which rises in its highest peak, mount Arrowsmith, to the height of 5900 ft., and whose buttress-like walls descend for the most part abruptly to the shore. There are, however, in many coast-districts, especially on the s.e. and e. sides, undulating tracts, thickly wooded in general, but here and there containing patches of open grass-land. The outline of the island is boldly picturesque. The shores are marked by abrupt rocky cliffs and promontories, by pebbly beaches and sheltered coves, with fine harbors. The w. shores are gloomy and frowning in aspect, deeply indented by fiord-like arms of the sea, the banks of which are formed by steep rocks, rising like walls. The surface is diversified by mountain, precipice, hill, dale, and lake, and the whole country is more or less densely wooded, except where the mountain summits afford no foot-hold for plants, or where open grass-lands occur. There are no navigable rivers, and the streams, which are torrents in winter, and are nearly dry in summer, are short, and are valuable only as supplying power for grist and saw mills. Springs are numerous, and the water excellent. The climate closely resembles that of Great Britain, subject, however, to modifications traceable to the position of the island. The ocean that washes its shores is throughout the whole year of a remarkably low temperature, owing to the arctic currents that sweep down along the coast, even to the lat. of San Francisco; and westerly winds blowing over the chilled sea-water, modify the climate of the island considerably. The winter, as a rule, is open and wet; the spring is later and colder than in England, and the summer drier and hotter. The maximum temperature is about 84° Fahr., and the minimum about 22° Fahr. Only a small proportion of the surface is suited for agriculture, four-fifths being little better than barren rock. The crops generally raised are wheat, barley, oats, and peas. The green crops are turnips, mangold-wurzel, vetches, potatoes —which flourish here in unsurpassed excellence—and all sorts of vegetables. Fruit-culture is a very profitable branch of industry. Gold has been found; coal is very abundant; and copper, silver, lead, and other ores abound. The puma, the bear, and wolf still range in the forests; two kinds of deer are found; there are two kinds of grouse; and snipe and wild-fowl in great variety. Salmon abound. Extensive banks lie about 32 m. off the s.w. shore. All of them are well-stocked with fish, especially the cod, herring, haddock, whiting, halibut, and sturgeon. Among the valuable woods of the island, the white fir, or Douglas pine, one of the best woods for spars known, is at once the commonest and most important. In some instances, this tree has been known "to square" 45 in. *for* 90 *feet*. The cedars have an average diameter of 6 to 7 ft., and one has been measured 14 ft. in diameter. Ship-building has sprung up, and is an important branch of industry. The island contains an abundance of coal, and gold, silver, iron, copper, and excellent marble are found. There are several fine harbors, the most important being that at Esquimalt, where an imperial naval station has been established. The island contains the city of Victoria, which is the capital of the province and the seat of the see of the Anglican lord bishop of British Columbia. Pop. of the electoral district of Vancouver, '91, 18,229.

VAN CURLER, Arendt, born Holland; became superintendent of the region around what is now Albany as early as 1642. Under Governor Stuyvesant he began and carried out that policy of peace and justice to the Indians by which the people of New Netherlands and New York enjoyed immunity from hostilities and the friendship of the Indians south of Canada until the revolutionary war divided even friends of the same household. New York and Pennsylvania were the only two colonies of which this could be said. In 1642 Van Curler rode into the Mohawk country to rescue three French prisoners from their captors. This was the first of many successful efforts by which Europeans were saved from death by torture. In 1661 he bought the "Great Flat" of the Mohawk river from the Indians, led a band of settlers from Albany, and founded Schenectady in 1662, the first agricultural settlement in the province, in which farmers could hold land in

fee-simple, free from feudal annoyances, such as paying rent to a patroon or local official. In 1667, being invited to visit the French governor of Canada, he, while on his way to Quebec, was drowned off Split Rock in lake Champlain.

VAN'DA, a genus of plants of the natural order *orchideæ*. *V. cærulea*, one of the most beautiful of Indian orchids, is highly prized by cultivators in America, and plants are sold at prices of $15 and upward. It has panicles of azure flowers. Dr. Hooker found it on the Khasia mountains, growing in great profusion.

VANDALIA, city and co. seat of Fayette co., Ill.; on the Kaskaskia river and the Illinois Central and the Vandalia line railroads; 70 miles e. of St. Louis, Mo. It contains a high school, national and state banks, co. court-house (which was the state house when Vandalia was the capital of Illinois), electric light plant, water supply for fire department from large cisterns, and a paper mill, chair factory, machine shop, and stave factory. Pop. '90, 2144.

VAN'DALS (Lat. *Vandăli*, also *Vindili* and *Vanduli*), a famous race of European barbarians, probably of Germanic, though some consider them of Slavonic origin. Procopius, who agrees with Pliny in considering them one with the Goths, states that they originally occupied the country about the *Palus Mæotis* (sea of Azov), but it would appear that afterward they migrated to the n.w., and settled s. of the Baltic, between the rivers Vistula and Viadus (Oder). They make their first appearance, however, as a historic people in the 2d c. A.D., at which time they inhabited the north-eastern slopes of the Riesengebirge (called after them, *Vandalici montes*), and figure as the associates of the Marcomanni and Quadi in the plundering expeditions into Pannonia, and the wars with Marcus Aurelius. In the latter half of the 3d c., they are found in the Roman province of Dacia, along with Goths and Gepidæ. According to Jornandes, the Gothic king, Geberic, annihilated a large part of the nation on the banks of the Maros. The remainder were transplanted by Constantine to Pannonia, where they lived in peace for 60 years. But at the beginning of the 5th c., urged, it is said by Stilicho, they abandoned their new homes, and in company with the Suevi, Alani, and other German tribes, led by their king, Godegisil, burst into Gaul, which they miserably wasted for the space of three years. Thence they swept through the passes of the Pyrenees into Spain, which experienced a similar fate; and finally, after much quarreling and fighting with their German associates, they settled in a part of Bætica, which received from them the name of *Vandalitia* (mod. *Andalusia*). In 429, at the call of Bonifacius, governor of Africa, who, from being the most reliable bulwark which the western empire possessed, had been driven into rebellion by the false representations of Aëtius (see VALENTINIANUS III.), they crossed the strait of Gibraltar, under their leader, Genseric (q.v.), in one resistless horde (numbering 50,000 to 80,000 in all), carrying devastation and ruin from the shores of the Atlantic to the frontiers of Cyrene. They were joined by the Donatists (q.v.), a sect of African heretics, and being themselves Arians, they inflicted great cruelties upon the orthodox Christians. Meantime Boniface had discovered the treachery of his rival Aëtius, and set himself, when too late, to remedy the dreadful consequences of his too credulous resentment. He advanced with a small and hastily-levied force, but was defeated with considerable loss, and driven into Hippo (now *Bona*), which he defended for more than 14 months. During the siege St. Augustine died—Aug. 28, 430. Boniface, re-enforced by a Byzantine army under Aspar, now sallied out upon the Vandals, and a second defeat decided the fate of Africa. In 439 Genseric broke the peace which he had concluded with Valentinianus III., in 435, and conquered Carthage. A new peace was established which recognized the authority of the Vandals over n. Africa from the Atlantic to Cyrene, over the Balearic isles, Sardinia, Corsica, and part of Sicily. In 455 the Vandals invaded Italy, and plundered Rome for 14 days. The manner in which they mutilated and destroyed the works of art collected in the city, has originated the application of the term *Vandalism* to all similar barbarism. After the death of Genseric (477), his son, Hunneric, cruelly persecuted the Catholics; warred against the Moorish races in n. Africa, who were trying to recover their independence, and kept the Mediterranean in a state of alarm by his piracies. His successors, Guntamund (d. 496) and Thrasamund (d. 523), were comparatively mild and tolerant rulers; the latter was even friendly to literature But the warm climate, and the love of luxurious pleasure, now began to enervate the spirit of the Vandals; and the natives in different parts of Africa, showed unmistakably that they had ceased to fear them. Thrasamund was compelled to solicit aid from his brother-in-law, Theodoric (q.v.), who sent him a Gothic contingent to help him against the Moors of Tripoli. After his death, Hilderic, a son of Hunneric, became ruler, but he showed such strong leanings toward Catholicism (owing to his long residence in Constantinople), that his subjects grew discontented, and he was overthrown by his uncle, Gelimer, in 530. This led to the emperor Justinian sending an expedition, under Belisarius, against Gelimer in 533. When the latter heard of the arrival of the great Byzantine general, he caused Hilderic and his sons to be put to death, but was himself soon after forced to seek refuge in the wilds of Numidia. In 534 he surrendered, was carried to Constantinople in triumph, and ended his life in Asia Minor. Most of the Vandals were drafted into the imperial army, and "used up" in the wars with Persia. The few who remained in Africa rapidly disappeared among

the natives.—See the various histories of the Roman empire; also Papencordt, *Geschichte der Vandal; Herrschaft in Afrika* (Berl. 1837).

VANDAMME, Dominique Joseph, Count, 1770–1830; b. Cassel, department of Nord; enlisted at Martinique, 1788; returning to France at the beginning of the revolution, became at the age of 22 a brig.gen. in the army of the north. Having served under Jourdan in the campaign of 1795, he was transferred to the army of the Rhine, and distinguished himself in all the wars of the empire, but in the Russian expedition took no part on account of a quarrel with Jerome Bonaparte, king of Westphalia. In 1813 he was forced to surrender with 10,000 troops to the enemy; was confined for some time in Russia; returned to France, 1814; went to the United States, 1816; returned to Cassel in 1824.

VANDERBILT, Cornelius, 1794–1877; b. N. Y.; of Dutch ancestry. He received but little education, and while a boy earned a living by carrying passengers and produce in a small boat (periauger) between New York and Staten Island, where he lived. The war of 1812 gave him an opportunity of enlarging his business by supplying the government posts with provisions; and he saved sufficient money to purchase a schooner and engage in the coasting trade. In 1817 he ran a steamboat from New York to New Brunswick, N. J., in connection with the passenger traffic with Philadelphia; and under his able management a line of steamboats was the result of this enterprise, which became very profitable. About the year 1830 he was building and running steamboats on his own account, and rapidly accumulating wealth. In 1851 he founded a steamship line from New York to California by the Nicaragua route, and was president of the company engaged in this enterprise. In connection with this line he succeeded in warping the steamboat *Central America* up the San Juan river, and through the Castillo rapids, placing her in lake Nicaragua for the transportation of passengers and freight; a feat which had been deemed impossible. Mr. Vanderbilt's extended connection with steamboats and steamships gave him the *soubriquet* of the "commodore," a title which clung to him till his death. In 1853 he built the steamer *North Star*, on which he took his family for a trip to Europe. Two years later he founded an independent line of steamships to Havre, and built the *Ariel* and *Vanderbilt* for this route. In 1862 he presented the *Vanderbilt*, which cost $800,000, to the U. S. government, for use during the war; an act for which he received the thanks of congress, while a gold medal was struck in his honor and duly presented to him. Mr. Vanderbilt turned his attention to the railroad business in 1863, connecting himself with the Harlem railroad, to which he advanced large sums of money, and of which he became president. He next undertook to re-organize the Hudson River railroad; purchased St. John's Park in New York for $1,000,000, and erected there a freight depot; and by his skillful and energetic management of these two lines soon placed them on a firm financial basis. In 1868 he became president of the New York Central railroad; which, in the following year, he consolidated with the Hudson River road, and formed of these two, with their connections, the most important trunk line in the country. He eventually laid four tracks on the line of this great system, thus enabling the transportation of grain from the w. on a scale otherwise impossible. Mr. Vanderbilt grew to be considered the foremost railroad magnate in America. His wealth had accumulated to a vast extent, and was dispensed liberally. He founded, in 1873, the Vanderbilt university at Nashville, Tenn., at a cost of more than $1,000,000. He was simple and unostentatious in his manners, fond of horses, and of the game of whist; devoted to magnificent operations in the direction of increasing the possibilities of American commerce.

VANDERBILT, William Henry, b. N. J., 1821; son of Cornelius. In the latter years of commodore Vanderbilt's life he relied greatly on the knowledge and judgment of his son William, who, on the death of his father, assumed the offices of president of the N. Y. Central and Hudson River, and New York and Harlem railroads. He conducted these complicated enterprises with such success that his name grew to become one of the three or four so-called "railroad kings" of America. In Jan., 1880, Mr. Vanderbilt parted with a large block of his stock in the N. Y. Central railroad, being 250,000 shares at 120, amounting to $30,000,000; the largest cash transaction in railroad securities ever made. Mr. Vanderbilt was the president of the Canada Southern and the Lake Shore and Michigan Southern railroads. He contributed handsomely to the Vanderbilt university at Nashville, Tenn., founded by his father, and was a patron of the fine arts. He d. 1885.

VANDERBILT UNIVERSITY, an institution for higher education at Nashville, Tenn., named in honor of Cornelius Vanderbilt from whom it received an endowment of $1,000,000. It was founded in 1872 by the Methodist Episcopal element in the South and its original name was The Central University of the Methodist Episcopal church, South. In 1896 there were 656 students in attendance and 80 members of the different faculties. Chancellor, J. H. Kirkland.

VANDERBURG, a co. in s.w. Indiana, having the Ohio river for its s. boundary; 230 sq.m.; pop. '90, 59,809, chiefly of American birth, incl. colored. Co. seat, Evansville.

VAN DER GOES. See Goes.

VAN DER HEYDEN. See Heyden.

VAN DER HOEVEN. See Hoeven.

VANDERLYN, JOHN, 1775–1852, b. New York; studied under Gilbert Stuart, and afterward in Paris by the assistance of Aaron Burr. In Italy he made many copies from the old masters, especially Correggio and Raphael. He lived in Europe, 1808–15. His "Marius seated amid the ruins of Carthage," was awarded the gold medal at the Louvre in 1808. In 1832 he began to paint a full length portrait of Washington for the hall of the house of representatives, and in 1839 the "Landing of Columbus" for the rotunda of the capitol.

VANDERVEL'DE, WILLIAM, commonly called the elder, in distinction from his son of the same name, was born in 1610 at Leyden. He was bred a sailor; and having a natural aptitude for art, he busied himself in drawings of marine subjects. These becoming known, were seen to be of great merit; and in 1666 he was chosen to sail with the fleet of the famous admiral de Ruyter, with a view to the commemoration on canvas of his exploits against the English. The sketches which he produced of several engagements which he witnessed procured him a great reputation; and in 1675 he was induced to settle in England as painter of sea-fights to Charles II., who allowed him a pension of £100 a year. On the death of Charles his services were retained at the same rate by his successor, James II. He died in London in 1693, and was buried in St. James's church-yard. His works were mostly colorless drawings, of great beauty and precision, many of which were afterward painted upon in oil by his much more famous son.

VANDERVELDE, WILLIAM, the younger, who was born at Amsterdam, in 1633. He received his education in art from his father, whom he followed to England. The designs produced by the father, the son was employed to color; and for this service, to him also a pension of £100 a year was assigned. This official and subsidiary employment was, however, the least important part of his activity, his time being mainly devoted to the series of original works which have given him assured rank as one of the greatest of marine painters. In his rendering of the ocean, in its various moods, Vandervelde has had few equals; and his works are now highly valued by the connoisseur. The best of them are to be found in England, the gallery at Bridgewater house being particularly rich in fine specimens. Vandervelde lived for the most part with his father at Greenwich; and after his death, in London, where, in 1707, he died.

VAN DIE'MEN'S LAND. See TASMANIA.

VANDYCK. See DYCK.

VAN DYKE, HENRY JACKSON, D.D., b. Abingdon, Montgomery co., Penn., 1822. He graduated at the univ. of Penn., 1843; studied at Yale coll., and graduated at Princeton theol. sem., 1845, during which year he was ordained in Philadelphia. He had charge of a Pres. church in Bridgeton, N. J., 1845–52, and of one in Germantown, Penn., 1852–53. He was pastor of the First Pres. church, Brooklyn, 1853–91, resigning to accept a chair in Union Theological Seminary. He died in 1891. He was prominent in the movement to reunite the northern and southern church, 1870, and held important positions in the general assemblies.

VAN DYKE, HENRY JACKSON, b. Germantown, Penn., 1852; son of the Rev. Dr. Henry J.; graduated from the Brooklyn Polytechnic inst., 1869; from Princeton coll., with high honors, 1873; and from Princeton theol. sem., 1876. He went to Germany, 1877, and studied at the univ. of Berlin; was pastor of the United Cong. church, Newport, R. I., 1878–82; then became pastor of the Brick Pres. church, New York; was preacher at Harvard, 1890–92, and Lyman Beecher lecturer at Yale, 1895–96. He published numerous works; among the latest, *The People Responsible for the Character of their Rulers, Responsive Readings, The Story of the Other Wise Man* (all 1895); *The Gospel for an Age of Doubt*, Yale lectures (1896); *The Builders and other Poems* (1897), etc.

VANE, Sir HENRY, a notable English politician of the 17th c., was born in 1612. His father, also a sir Henry, was a distinguished statesman in the reigns of king James I. and Charles I., and received many proofs of the royal favor; but having taken part in the prosecution of Strafford (q.v.), he was deprived of all his offices of honor and emolument. When the parliament rose against the king, Vane remained neutral; and some time before the execution of Charles, he withdrew to his seat at Raby castle, where he died in 1654.—Sir HENRY VANE, the younger, studied at Westminster and Magdalen hall, Oxford, where he appears to have embraced, with all the inconsiderate enthusiasm of his character, those republican principles for which he afterward became so famous. His travels in France and Switzerland strongly confirmed him in his aversion to the government and discipline of the church of England, and in 1635 he sailed for New England—the refuge of disaffected spirits in those days. He was soon after chosen by the people governor of Massachusetts; but his predilections in favor of "antinomian" opinions soon robbed him of his popularity, and in 1636, or thereabout, he returned home. He now married a daughter of sir Christopher Wray of Ashby, in Lincolnshire, and entered on a political career. Through his father's interest, he was appointed treasurer of the navy, along with sir William Russell, and entered parliament for Kingston-upon-Hull, in 1640, but almost immediately joined Pym and the anti-court party, of which he became one of the most vehement and resolute leaders. When the civil war broke out, no man was more conspicuous in the military and theological politics of the time than Vane. He carried to the house of peers the articles of impeachment against archbishop Laud; he was a member of the Westminster assembly; a "great

contriver and promoter of the solemn league and covenant" (though in his heart he abhorred both it and presbytery, and only used them as a means of crushing the bishops); the chief instrument in carrying the "self-denying ordinance" (1644); and one of the commissioners at the treaties of Uxbridge (1644–45) and the isle of Wight (1648). But he did not view with satisfaction the increasing power of Cromwell and the army. He was too extravagant a parliamentarian, too much of a visionary and enthusiast to be pleased with the supremacy of the musket and saber, and for some time he withdrew altogether from public affairs. On the establishment of a commonwealth, however, in Feb. 1649, Vane was appointed one of the council of state; yet his antipathy to Cromwell and his factious, pragmatical, hair-spliting activity so much increased, that the former, who looked upon Vane as a subtle promoter of divisive courses, called him a "juggling fellow;" and was probably in deep earnest, when, at the dissolution of the commons, in April, 1653, against which Vane protested with a sort of feminine sharpness, he cried out: "The Lord deliver me from sir Harry Vane!" In 1656 Vane wrote a book, entitled *A Healing Question Propounded and Resolved*, which was so hostile to Cromwell's protectorate, that it was found necessary to imprison the author in Carisbrooke castle, isle of Wight. He was released after a detention of four months, and attempts were made by Cromwell to win him over, but Vane was inflexible in his fanaticism; and during the rule both of Cromwell and Richard, he maintained an attitude of sullen discontent. After meddling a little in the helpless intrigues that followed the abdication of Richard, he was ordered by parliament to withdraw to his house at Raby. When the restoration took place, Vane was one of the 20 persons excluded from the *Act of General Pardon and Oblivion;* and in July, 1660, he was committed to the tower. On June 2, 1662, he was arraigned and indicted of high treason before the Middlesex grand jury, found guilty (on the 6th), and on the 14th was beheaded on Tower hill. His son was knighted by king Charles, and raised to the peerage by king William as lord Barnard of Barnard castle. Vane was a subtle, restless, crotchety, unwise kind of man—a real thorn in the flesh of the great Cromwell. He was one of the fifth monarchy sect, and much given to extravagant religious musings, and to praying (with his friends) in language wholly unintelligible. He also wrote several political and theological treatises, which do not require special mention.—See *The Life and Death of Sir Henry Vane, Knight* (London, 1662); Birch's *Lives;* and Ludlow's *Memoirs.*

VANGS, ropes on either side of a gaff, for steadying, or acting as braces to, a fore-and-aft sail.

VANILLA, a genus of parasitical *orchideæ,* natives of tropical parts of America and of Asia, which spring at first from the ground, and climb with twining stems to the height of 20 or 30 ft. on trees, sending into them fibrous roots produced from nodes, from which the leaves also grow. These roots, drawing sap from the trees, sustain the plant, even after the principal root has been destroyed. The stem is four-cornered and juicy; the leaves long and fleshy. The flowers are in spikes, and are very large, fleshy, and generally fragrant. The fruit is a pod-like, fleshy capsule, opening along the side. The *vanilla* of commerce was formerly supposed to be the fruit of *V. aromatica,* a native of tropical America, but is now ascertained to be chiefly, if not wholly, the fruit of *V. planifolia,* a species indigenous to Mexico, Guiana, Brazil, Peru, etc., and cultivated also in some of the West India islands, the Mauritius, and Ceylon. The fruit is cylindrical, about a span long, and less than half an inch thick It is gathered before it is fully ripe, dried in the shade, and steeped in a fixed oil, generally that of the cashew nut. It contains within its tough pericarp a soft black pulp, in which many minute black seeds are imbedded. Vanilla appears in commerce in packets of 50 to 100 pods, wrapped up in cane-leaves and sheet-lead, or in small tin boxes. It has a strong, peculiar, agreeable odor, and a warm sweetish taste. The interior pulp is the most aromatic part. Benzoic acid is sometimes so abundant in it as to effloresce in fine needles. Vanilla is of little use in medicine, although it is a gentle stimulant and promotes digestion, and in large doses is said to be a powerful aphrodisiac; but it is much used by perfumers, and also for flavoring chocolate, pastry, sweetmeats, ices, and liquors. Balsam of Peru is sometimes used as a substitute for it, as it is expensive, and the whole quantity imported into Britain does not exceed four or five cwt. annually. It is in very general use in South America. Several kinds are distinguished in commerce. The best is that called *leg* or *lec,* which is almost of a black color, and covered with crystals of benzoic acid. Another kind, less fragrant, dryer, and of a darker color, is known as *simarona.* A still inferior kind, with much broader, brown capsules, is called *pompona,* or *bova.* When the fruit of vanilla is fully ripe, a liquid (*baume de vanille*) exudes from it which is unknown in Europe, but is valued in Peru. Vanilla has ripened its fruit in British hot-houses, but the flowers are apt to fall off without fruit being produced, unless care is taken to secure it by artificial impregnation. This is, in some measure the case even in the East Indies, and in some parts of America itself; and it is supposed that the presence of some insect, delighting in the flowers of the vanilla, makes it more productive in other parts of America, especially in Mexico.

VAN LENNEP, Henry John, d.d., b. Smyrna, 1815; sent to the United States for education at the age of 15; studied at the Mt. Pleasant institution, Amherst, Mass.: graduated, Amherst college, 1837; studied theology at Andover; sailed as a missionary

of the American board to Turkey, 1839; stationed in Constantinople, Smyrna, and Tocat in connection with educational institutions; traveled in Greece, Palestine, and Egypt; returned to the United States, 1869, and became a professor in Ingham university, Le Roy, N. Y., and principal of Sedgwick institute, Great Barrington, Mass. He d. in 1889.

VANLOO, Charles André, younger brother of Jean, was born in 1705, at Nice. As a boy, he was with his brother at Rome, and studied under Benedetto Luti. He accompanied his brother in 1719 to Paris, where, after some little interval, in which he was employed as a decorative artist at the opera-house, he betook himself to portrait painting. He returned in 1727 to Rome, and there he executed some works which laid the basis of his future reputation, procured him, through the influence of the cardinal De Polignac, a pension from the king of France, and in 1729 the title of cavaliere from the pope. On leaving Rome, he visited Turin, painted there for the king of Sardinia a series of subjects from the *Jerusalem Delivered* of Tasso, and returned to Paris in 1734. The year following he was made a member of the academy, and his subsequent career was one of full prosperity. Tempting offers were made him by Frederick the great, who desired to have him in his service; but he declined them in favor of a nephew, preferring to remain in Paris. In 1751 he was made by Louis XV. a knight of the order of St. Michael; and in the course of the same year he became director of the academy. In 1762 he was made chief painter to the king, and three years after he died. As the last really great specimens of the old French school of historical painting, his works have still their admirers.

VANLOO, Jean Baptiste, a member of a family originally Flemish, in which a love of art seemed indigenous, was born at Aix in Provence, in 1684. His grandfather and father were both painters of some talent, and under the instruction of the latter, while yet a mere boy, he is said to have attained considerable proficiency as an artist. Subsequently he settled himself as such at Nice, and afterward at Toulon, where he married the daughter of an advocate. On quitting Toulon, on the occasion of its being besieged by the duke of Savoy in 1707, he returned to his native place, and abode some years there. He was again at Nice in 1712, and in the year following he visited Genoa and Turin. At the latter of these cities he won the favorable regard of the prince of Corignano, son-in-law of the duke of Savoy, and was sent by him to study at Rome as a pupil of Benedetto Luti. After a further residence at Turin, he proceeded in 1719 to Paris, where apartments were assigned him in the hôtel of the prince his patron. Here he speedily acquired a great reputation as a portrait-painter. He was made a member of the academy in 1731, and professor of painting in 1735. The loss of a large sum of money in the Mississippi scheme induced him to come, in 1738, to London, where his portraits soon distanced all rivalry. His health, however, having given way, he retired in 1742 to his native district, Provence, where he died 1745.

VAN MARCKE, Émile, b. Sèvres, France, in 1827; studied art under Troyon; was celebrated chiefly as a painter of cattle; was a chevalier of the Legion of honor; exhibited several pictures at the Paris salon. Among his best known works are, "The Village Pasture, Normandy," 1875; "A Herd of French Cattle," "Landscape with Cattle," 1876, and "The Spring at Neslette, in Normandy," 1877. He d. 1890.

VANNES, a seaport town of France, capital of the department of Morbihan, stands at the mouth of the Vannes, which falls into a narrow inlet of the gulf of Morbihan, 310 m. w.s.w. of Paris by railway. The town is surrounded by high walls flanked with towers. The cathedral and the museum are the most important edifices. Pop. '91, 19,625.

VANNUCCI PIETRO. See Perugino.

VAN OOSTERZEE, Jan Jacob, b. Holland, 1817; educated at Utrecht, and became a minister of the Reformed church. He was a minister of the most important church in Rotterdam, and gained a high reputation as a pulpit orator, 1844–62, when he was appointed professor of systematic and practical theology at Utrecht. Among his works are *The Life of Jesus; Theology of the New Testament,* and *Christian Dogmatics.* D. 1882.

VAN RENSSELAER, Cortlandt, d.d., 1808–60; b. N. Y.; graduated Yale college 1827; admitted to the bar, 1830; studied theology at Princeton seminary; ordained, 1835; preached in Virginia; pastor of First Presbyterian church, Burlington, N. J., 1837; corresponding secretary of the board of education of the Presbyterian church, whose affairs he conducted with great efficiency; agent for Princeton college, for which he raised $100,000. He contributed largely to the *Presbyterian Magazine,* which he had founded; and published addresses, sermons, and essays. A posthumous volume of *Essays and Discourses, Historical and Practical,* was edited by his son.

VAN RENSSELAER, Henry Killian, 1744–1816; b. N. Y.; col. of a N. Y. regiment in the revolution. In 1777 he repelled an assault by the British near fort Ames, but retired on the evacuation of Ticonderoga by Gen. St. Clair. He participated in the operations about Saratoga, and was dangerously wounded. A mutiny in his regiment, caused by the disputes between New York and New Hampshire, was suppressed by Washington.

VAN RENSSELAER, Stephen, known as "the Patroon," an American statesman, and patron of learning, was b. N. Y., Nov. 1, 1769, the fifth in descent from Kiliaen Van Rensselaer, the original patroon or proprietor of the Dutch colony of Rensselaerwyck,

who in 1630, and subsequently, purchased a tract of land near Albany, 48 m. long by 24 wide, extending over three counties. He was educated at Princeton and Harvard colleges, and married a daughter of Gen. Philip Schuyler, a distinguished officer of the revolution. Engaging early in politics, at a period when they were the pursuit of men of the highest social position, he was, in 1789, elected to the state legislature; and in 1795, to the state senate, and became lieutenant-governor, president of a state convention, and canal commissioner. Turning his attention to military affairs, he was, at the beginning of the war of 1812, in command of the state militia, and led the assault of Queenstown; but the refusal of a portion of his troops, from constitutional scruples, to cross the Niagara river, enabled the British to repulse the attack, and the gen. resigned in disgust. As president of the board of canal commissioners for 15 years, he promoted the New York system of internal improvements; as chancellor of the state university, he presided over educational reforms; and as president of the agricultural board, aided to develop the resources of the state. At his own cost he employed Professors Eaton and Hitchcock to make agricultural surveys, not only of his own vast estates, but of a large part of New York and New England, the results of which he published in 1824; he also paid Prof. Eaton to give popular lectures on geology through the state. In 1824 he established at Troy an institution for the education of teachers, with free pupils from every county. Widening the sphere of his political interests, he went to congress in 1823, and served several terms, exerting a powerful influence, and securing the election of John Quincy Adams as president of the United States. After an active, useful, and honorable career, worthy of his high position, he died at Albany, Jan. 26, 1839.

VAN SCHAICK, Gozen, 1737–87; b. Albany, N. Y.: was in the expedition against Crown Point in 1756, and in the French, Indian, and revolutionary wars. In the latter he was sent to Cherry Valley to protect that settlement from the depredations of the British and Indians. He was engaged in the battle of Monmouth, and for his services in the war with the Onondaga Indians received the thanks of congress; brevetted maj.gen. 1783.

VAN VEEN, Otho (called also Ottovenius), an eminent painter, was a native of Leyden, of which city his father was a wealthy burgomaster. The exact year of his birth is involved in some obscurity; but there seems tolerable evidence to fix it as about 1556–57. He received a careful education, and in aid of the natural talent he displayed for drawing, the best masters were procured him. When about 15 years old he was sent to Liége, whence, after a residence of three years, he proceeded to Rome, where he became a pupil of the celebrated Zucchero. In Italy he remained about eight years; and on his return home by way of Vienna, the emperor, by tempting offers, vainly endeavored to detain him in his service. It is significant of the estimation in which he had come to be held as an artist, that on his passing through Munich and Cologne, similar offers were pressed upon him. These also, however, he declined, wishing to settle in his native country. Finally, he went to reside at Brussels, as painter to the famous Alexander Farnese, duke of Parma, and then governor of the Spanish Netherlands, of whom he executed a masterly portrait in armor, which greatly increased his reputation. The duke having died, he established himself at Antwerp, and opened an academy, at which the great Rubens was one of his pupils. In the matured art of Rubens, traces of his master are still, it is thought, to be detected; and in particular, he is held to have in all probability derived from him that fondness for allegorical and emblematic subjects which possessed him not always to his advantage. On the occasion of the entry into Antwerp of the new governor, the archduke Albert of Austria, Van Veen was employed to design the arches and the other decorative business of the ceremonial, and so pleased was the duke with the taste and invention displayed, that he appointed him master of the mint at Brussels, to which city he returned to reside. An invitation to Paris was subsequently sent him by Louis XIII., but this he saw fit to decline; and in Brussels, at the age of 78, he died.

The chief works of Van Veen are religious pictures for churches. In the cathedrals of Leyden, Antwerp, and Bruges, good specimens may be found. On their own account they deserve attention; but it is chiefly as "the work of a man who had the honor to be the master of Rubens" (to quote the words of Reynolds), that they now are esteemed.

VAN WERT, a co. in w. Ohio, bounded on the e. by the Miami and Erie canal; 405 sq.m., pop. '90, 29,671, chiefly of American birth. Co. seat, Van Wert.

VAN WERT, village and co. seat of Van Wert co., O.; on the Cincinnati, Jackson, and Mackinaw and the Pennsylvania Co.'s railroads; 30 miles s.e. of Fort-Wayne, Ind. It contains public and high school libraries, three public parks, electric light plant, waterworks supplied from wells, national banks, about a dozen churches, railroad machine shops, and piano, sucker rod, stave, and handle factories. The village was incorporated about 1868, is in an agricultural region, and has daily and weekly newspapers. Pop. '90, 5512.

VAN ZANDT, a co. n.e. Texas, bounded on the n.e. by the Sabine river; 840 sq. m. pop. '90, 16,225, chiefly of American birth, with colored. Co. seat, Canton.

VAPEREAU, Louis Gustave, b. France, 1819; educated at the Orleans college and the Paris normal school. He lectured on philosophy at the college of Tours for ten years; studied law, and became advocate in 1854. The first edition of his *Dictionnarie*

des Contemporains appeared in 1858; several editions of which have since been published. He has also published a *Dictionnaire Universel des Littérateurs*, and edited the annual *L'Année Littéraire et Dramatique* and other kindred works.

VA'POR. As all *solids*, with the exception of carbon (an exception most probably due to our not being able to produce a sufficiently high temperature), are melted, or rendered *liquid* by the application of heat (q.v.), so a further application of heat converts them into *vapor*. A vapor is really a gas, but it requires a little consideration to convince ourselves of the fact. Perhaps the best proof that can be given is that supplied by the beautiful experiments of Faraday (q.v.) and others on the liquefaction of gases. Hydrogen, oxygen, and nitrogen were long exceptions; but now all gases have been liquefied by a proper application of pressure or cold, or of cold and pressure combined. The difference, in common language only, between a vapor and a gas is this: A gas is a substance which at ordinary temperatures and pressures exists in a state of vapor; while a vapor is produced by the application of heat to a substance which is ordinarily found in the solid or liquid form. In other words, gases are the vapors of substances which, in the liquid form, boil at very low temperatures.

The most familiar instance of vapor is aqueous vapor, or steam (q.v.). At all temperatures, even as low as the freezing-point, ice and water give off vapor; and the quantity produced is determined by the temperature alone; that is, evaporation (q.v.) at any temperature continues (more or less slowly according to the quantity of air or other gas which is present) until the pressure exerted by the vapor upon the containing vessel attains a certain definite value, depending on the temperature alone. If the temperature be such that the corresponding vapor-pressure is equal to the pressure of the air, vapor comes off freely, and we have the phenomenon called boiling.

Vapor in a vessel which contains some unevaporated water is thus always *saturated*, as it is called, i.e., the full amount of vapor capable of existing at the temperature of the vessel is present. If it be compressed, some is liquefied; if allowed to expand, more vapor is formed.

If, however, there be no water present in the liquid form, and the temperature be gradually raised, the pressure of the vapor will rise, but much more slowly than when water is present, because no more vapor can be formed. In this state—that of *superheated* steam—vapor behaves almost exactly as an ordinary gas.

Chlorine, carbonic acid, sulphurous acid, etc., thus exist at ordinary temperatures as *superheated* vapors; and can therefore be reduced by cold and pressure to the condition of *saturated* vapor, when they are easily liquefied by carrying the process further.

Aqueous vapor may be liquefied by cold alone, or by pressure alone, as we have seen; and at ordinary temperatures it is easy to liquefy sulphurous acid, ammonia, and even carbonic acid and laughing gas, by mere compression. Gases absorbed by charcoal, or by spongy platinum, i.e., condensed by intense molecular forces on the large surface presented by the interstices in these bodies, must in all probability exist in the state of liquids. Carbonic acid is liquefied when exposed to a pressure of 35 atmospheres at ordinary temperatures; and some varieties of charcoal absorb from 80 to 100 times their bulk of this gas. Remembering that, on account of the impenetrability of matter, the gas can only be in the *pores* of the charcoal, and that their whole bulk forms but a small fraction of that of the charcoal itself, we see that in all probability the absorbed gas must be condensed so enormously as to have become liquid. It is probable that in Graham's recent process, for separating by dialysis (see OSMOSE) the oxygen and nitrogen of the atmosphere, the film of vulcanized india-rubber which is employed as septum compels these gases to pass through its pores in a liquid form.

Some extraordinary experiments, due to Cagniard de la Tour (the inventor of the Sirène, q.v.), have given us valuable information on the subject of vapors. He showed that when water, ether, and other liquids are hermetically sealed in glass tubes, so as to fill from a quarter to a half of the tube, the application of the requisite amount of heat is sufficient to convert the whole into vapor. This vapor, therefore, has a density equal to half or quarter of that of the liquid! Ordinary steam from boiling water has only about $\frac{1}{1700}$ of the density of water (in common language, a cubic inch of water gives a cubic foot of steam). These experiments are very dangerous.

Some important experiments of this nature are due to Andrews. Having, by mere pressure, partially liquefied carbonic acid in a glass tube, he raised the temperature gradually, and observed that the demarkation between the liquid and the gas became less and less definite; the capillary curvature of the surface of the liquid also diminishing. At about 88° Fahr., the liquid surface became horizontal, and the liquid disappeared. The tube then appeared to be filled with a homogenous substance, neither gaseous nor liquid; apparently a new state of matter. When the temperature was slightly diminished, or the pressure relaxed, there was a singular appearance of flickering striæ, such as one sees on mixing alcohol and water, or on looking through the column of irregularly heated air rising from a hot body. No pressure that Andrews could apply, not even 400 atmospheres, could liquefy this gas when its temperature was above 88° Fahr. It appears that for every gas there is a point of temperature above which it is impossible by any amount of pressure to liquefy it.

The so-called permanent gases—oxygen, hydrogen, and nitrogen—have at last yielded

to the patience and skill of M. Pictet of Geneva and M. Cailletet of Paris, and have been liquefied, or even solidified. In the last months of 1877 oxygen was liquefied under a pressure of 500 atmospheres; hydrogen, when subjected to a pressure of 280 atmospheres; and nitrogen, under a pressure of 200 atmospheres.

VAR, a department in the extreme s.e. of France, bounded on the s. and s.e. by the Mediterranean, and on the n.e. by the department of Alpes Maritimes. See Alpes Maritimes. Area, 2349 sq.m.; pop. '96, 309,191. The department receives its name from the river Var, which formerly served as its boundary on the e., but which, since the arrondissement of Grasse was taken from the department of Var, and added to that of the Alpes Maritimes, now belongs entirely to the latter. Var is well watered by a great number of streams, of which the chief are the Gapau, Argens, and Bianson. In the n. and n.e. it is mountainous, being traversed by a branch of the *Alpes de Provence*, called the Monts de l'Esterel. Between the mountains and the water-courses are many very fertile valleys. The climate of Var, tempered by the altitude of the surface, is pleasant. Fruits of all kinds are here cultivated with remarkable success; tobacco is grown, and the department abounds in minerals; an active commerce is carried on, the exports being chiefly wine, fruits, olive-oil, and other agricultural and horticultural products. It is divided into the three arrondissements of Draguignan, Brignoles, and Toulon. Capital, Draguignan.

VARANGIANS (Ger. *Waräger*, or *Väringer*), a Norman people of the Baltic coast, who greatly damaged by their piracies the commerce of the republic of Novgorod, and subjugated repeatedly the Slävic and Finnish peoples of northern and central Russia. They forced the Krivitches, Tschudes, and other tribes to pay tribute, and wrested from the Russians the districts now known as Revel, Petersburg, and Archangel; the Russians retreating into Finland and Karelia. Gradually the two nations became intermixed, and toward the 9th c., the names Russian and Varangian appear to have been considered synonymous. In 862, the rulers of this Russo-Varangian nation, Rurik (q.v.), Sineous, and Truvor, were invited by the federative state of Novgorod, in which the Släves were dominant, to put themselves at its head, and Rurik accepting the invitation, founded the Russian monarchy. See Russia. The Varangians were at first distinguishable in various ways above the other peoples of the Novgorod state; but being far inferior in number, were soon forced to adopt the Slävic tongue, conform to Slävic manners, and so become merged in the predominant population. The great success which attended this experiment of the Novgorod confederacy, induced other Slävic states which were located on the Dnieper to put themselves under the protection of the warlike Varangians; and accordingly we find, soon after 862, a second Slävic state at Kiev, under the rule of Oskold, a Varangian chief, and the conqueror of the barbarous Chazars. After Rurik's death, his successor in power, the Regent Oleg, united Kiev to Novgorod, making Kiev the capital—a position it held till supplanted by Moscow (q.v.).

VARAN´IDÆ, a family of saurian reptiles, having a very elongated body, without a dorsal crest; strong legs, and long unequal toes; the tail long and slightly compressed; the scales tuberculous, and arranged in rings; the tongue protractile, dividing into two points as in serpents. Some of them are aquatic, and some inhabit dry and sandy places. The terrestrial species have the tail conical; the aquatic species have it compressed and often crested, so that it becomes a powerful organ of locomotion in water. The motion of the terrestrial species is aided by the tail, and is always serpentine. Some of the varanidæ attain a large size. They feed on animal food of any kind, and have been seen to attack a young deer swimming across a river. The species are not numerous, and belong chiefly to the eastern hemisphere.

VARAZ´ZÉ, a small t. of northern Italy, in the province, and 18 m. s.w. of the city of Genoa. Some trade in wood and extensive construction of fishing-boats are here carried on. Pop. '81, 8237.

VARDÖE, an island in the Arctic ocean, off Finland, lat. 70° 20′ n., long. 31° 10′ east. It belongs to Norway. Its fortified town, Vardöehuus, is the most northerly town in Europe.

VA´REC, an old name for crude carbonate of soda.

VARE´SE, a t. of northern Italy, in the province of Como, and 13 m. w. of the town of that name. It is a handsome town; contains a number of fine palaces and magnificent villas; and carries on manufactures of silk, cotton, paper, and hats. Pop. '81, commune, 13,966. Varese is of very ancient origin. The Romans kept it strongly garrisoned as a stronghold against invasion from the north.

VARGAS, Luis de, 1502–68; b. Seville, Spain; studied art in Italy and for many years resided in Rome. On his return to Seville he painted many frescos, altar pieces, etc., for the churches. Of these the best, still preserved in his native city, are "La Generacion," "Jesus bearing the Cross," and "Adam and Eve." His portrait of the duchess of Alcalá is one of the finest works of art of the century.

VARIATION, in music, a transformation of a melody by melodic, harmonic, contrapuntal, and rhythmic changes. The subject chosen is called the theme; it is first simply harmonized with or without an introduction, and then repeated in a variety of different

transformations and the variations collectively with the theme constitute the piece Occasionally the different variations are combined by an intermediate passage; but generally each has its separate close, and the whole terminates with an extended and richly-developed variation, or a coda.

VARIATION OF THE COMPASS. See TERRESTRIAL MAGNETISM.

VARICEL'LA (Lat. a little pimple), popularly known as chicken-pox (q.v.).

VARICK, RICHARD, 1753–1831; b. Hackensack, N. J.; practiced law in New York city before the revolutionary war, and entering the army commanded a company, became military sec. to Gen. Schuyler commanding the northern army, and filled other responsible offices until the capture of Burgoyne 1777. In that year he was appointed inspector gen. at West Point, holding the post until Arnold's treason was exposed; then became recording sec. at Washington's headquarters, with the rank of col. He was recorder of the city of New York, 1783–89; atty. gen. of the state, 1789, afterward mayor of the city. Associated with Samuel Jones, he revised the state laws in 1786. He was one of the founders of the American Bible society, and its president, succeeding John Jay.

VARICOCELE' (known also as CIRCOCELE) is a term used in surgery to designate a varicose state of the veins of the spermatic cord. It is caused by the same conditions which give rise to varicose veins (q.v.) elsewhere—viz., weakness of structure, combined with obstruction through corpulence, constipation, etc., to the return of the venous blood. For a description of its symptoms, and of the suitable treatment, we must refer to any ordinary text-book of surgery.

VARICOSE VEINS. When a vein becomes dilated at a certain part of its course, for no apparent physiological object, such as relieving the venous circulation elsewhere (as, for example, in the case of the superficial abdominal veins enlarging in order to relieve a compressed vena cava), it is said to be varicose, the actual dilatation being called a *varix* (a word used in this sense by Cicero and Celsus). Some veins seem to be unaffected by varices, which, however, are of common occurrence in the sub-mucous veins of the rectum (constituting hemorrhoids or piles), in the spermatic veins, giving rise to varicocele (q.v.), and in the veins of the lower extremities. They are occasionally (but very rarely) found in other veins. Certain conditions of the system favor the formation of varices, among which may be noticed an indolent temperament, and a debilitated condition of the general system, accompanied by a relaxed state of the walls of the veins; and possibly also a congenital predisposition or hereditary tendency. Persons with such a predisposition are more likely to suffer from this affection if their occupation is one which involves much standing or walking; and cooks, washer-women, and foot-soldiers have been selected as specially prone to varicose veins. Varices may occur at almost any period of life, but are chiefly developed during middle age. Their formation is aided by any condition of the system which impedes the circulation, as certain diseases of the heart, lungs, and liver; and by continued *high living*, which is especially liable to induce hemorrhoids. From the researches of Andral, it appears that in varicose veins the coats of the dilated vessels may become thickened or may become thin; that they may be lengthened so that the veins become tortuous; and that the dilatation may be unequal, giving rise to the formation of pouches; and that, in consequence of the enlarged caliber of the vessels, the veins only act imperfectly, and gradually undergo degeneration. Varices occurring in the leg, to which our remaining observations apply, commonly give rise to deep-seated aching pain in the limb, with a sense of weight, fullness, and numbness, before there is any external appearance of the affection. In a more advanced stage, the ankles swell in the evening, and the feet are always cold. After a time, a small tumor of a bluish tint appears, which disappears on pressure, but returns on the removal of the pressure, and is caused by a dilating vein. This dilatation extends, and forms knotty, irregular tumors, soft to touch, diminishing on pressure, or on the patient's assuming a horizontal posture, and giving a bluish tint to the adjacent skin. These tumors commonly occur in the middle of the leg, along the track of the saphena veins, but they often extend along the whole of the leg and thigh. With regard to treatment, it may be mentioned that old varices cannot be cured, except by operations dangerous to life, although much may be done for their relief. In their earlier stages, they are, however, more amenable to treatment. As the disease is a very common one, we shall enter somewhat in detail into the palliative treatment which any one may adopt for himself. The venous circulation of the limb should be as much as possible facilitated by the disuse of garters; by keeping the limb (if the means and condition of the patient permit it) in a horizontal position for a month or six weeks; by prohibiting walking, and allowing only carriage-exercise, with the leg elevated to the horizontal position The limb should also be carefully bandaged from the toes to above the knee, the bandage being replaced daily, and the limb then well rubbed with the hand, or with a flesh-brush, for ten minutes or more, from below upward, so as to stimulate the circulation. When the circumstances of the patient hinder this treatment, elastic stockings may be tried during the day, or ordinary bandages, with a pad of lint placed on each varicose cluster before the bandage is applied. In cases where only one or two trunks are affected, the disease may be prevented from extending by the application of pieces of wash-leather spread with soap-plaster firmly over them. At the same time, the general

health must be attended to. Ill-nourished, feeble patients must be treated by tonics and nourishing diet; while over-fed, plethoric patients require mild but often repeated purgatives to relieve the portal circulation. In the numerous cases in which there is a relaxed condition of the veins, the tincture of sesquichloride of iron may usually be given with advantage in half-dram doses thrice daily in half a tumbler of water, with a colocynth pill every second night, to obviate the constipating action of the iron. Among the means of effecting a *radical cure*, by causing coagulation of the blood in the dilated veins, when they shrink and contract permanently, are (1) caustic potash applied over the course of the vessel, (2) subcutaneous incision of its walls, and (3) compression of the vessel between a steel pin and a twisted suture. We believe that the cases are rare in which the pain of the varix is so great as to disqualify a patient from his ordinary work, and these are the only ones in which any of these operations should be recommended; "and the patient," says Mr. Callender, "if wise, will be contented with the palliative measures of a more simple character."—Holmes's *System of Surgery*, vol. iii., p. 321. Among the troublesome consequences of varicose veins are the obstinate ulcers, known as varicose ulcers, to which they give rise; and it must be borne in mind that occasionally, when the skin gets thinned by prolonged pressure, the varices burst through it, and give rise to hemorrhage, which, if not promptly stopped, may cause fainting, and even death. When such an accident occurs, the patient should at once be placed in a horizontal position, and the leg raised, in which case the bleeding will probably cease. If it continue, a pad of lint must be pressed upon the mouth of the bleeding vessel by means of a few turns of a bandage round the limb.

VARIETY, in natural history, a term employed to designate groups subordinate to species (q.v.). Varieties are regarded as less permanent than species; and those who regard species as perfectly distinct in their origin, look upon varieties as modifications of them due to particular causes. Of course those who adopt Darwin's view of species do not deem the distinction between species and varieties so important, but rather consider varieties as species in process of formation. However this may be, all naturalists acknowledge a difficulty of deciding what are varieties and what are species; and some reckon as varieties what others regard as distinct species. The whole subject is involved in difficulty, and must be studied both with respect to general principles, and to the peculiarities of particular cases. Whatever theory may be adopted, many of the groups now distinguished by particular names are doubtful, and their designations must be regarded as merely provisional. It cannot be certainly said whether they are varieties or species. The term *variation* has been employed by some authors to designate forms less permanent than varieties, but the term has not obtained general acceptance.

VARI'NAS, or BARINAS, a t. of Venezuela, in the province of Zamora, near the San Domingo. It stands at the entrance to a valley covered with tobacco-plantations. Varinas carries on a trade in tropical productions and in cattle. Pop. stated at 4000.

VARI'OLA. See SMALL-POX.

VA'RIX. See VARICOSE VEINS.

VARNA, an important seaport of the principality of Bulgaria, on the northern side of a semicircular bay, an inlet of the Black sea, 189 m. n.n.w. of Constantinople. The congress of Berlin in 1878 decided that the strong fortifications by which the port was formerly defended should be destroyed. Varna stands on a sandbank, and the city wall, the base of which in some places is 20 or 30 ft. above sea-level, is in other places on a level with high-water. It is the ancient *Odessus*. The town itself is crooked, irregular, dirty, and dilapidated, and as viewed from the sea, it presents a huge jumble of red-tiled houses, interspersed here and there with mosques and minarets. There are a number of distilleries, breweries, tanneries, and soap factories. Pop. '93, 28,174. The allied French and British troops were here encamped for some time in 1854.

VARN'HAGEN VON ENSE, KARL AUGUST LUDWIG PHILIPP, 1785–1858; b. Düsseldorf; studied medicine at the university of Berlin, and in 1804, in conjunction with Chamisso, published a *Musen-almanach*. He then studied philosophy at Halle, Berlin, and Tübingen. In 1809 he received a commission in the Austrian army, and was wounded at the battle of Wagram. In 1813 he accepted a commission as capt. in the Russian army, and accompanied Tettenborn as adjt. on his march to Paris. He then entered the Prussian diplomatic service, and accompanied prince Hardenburg to the congress of Vienna in 1814. After the war of 1815 he was appointed resident minister at Karlsruhe, where he remained till 1819, when he retired from public affairs, and devoted himself to literature at Berlin. He published *Deutsche Erzählungen* (1815); *Vermischte Gedichte* (1816); *Göthe in der Zeugnissen der Mitlebenden* (1823); *Biographische Denkmale* (5 vols. 1824–30); and *Denkwürdigkeiten und vermischte Schriften* (7 vols. 1843–46) and other works.

VARNISH is a solution of some resinous material in any proper solvent, alcohol and oils being the ones chiefly employed. The solution must be of such consistency as to enable it to be very thinly and smoothly spread over the surface intended to be var-

nished, so that when it dries, it leaves a thin resinous coating, which is either naturally glossy, or can be made so by mechanical polishing. From the extremely inflammable nature of the material employed, the preparation of varnish is extremely dangerous, and should not be attempted except in premises specially adapted for the purpose, and with skilled workmen. The resinous gums, such as copal, anime, and mastic, and the various kinds of lac, are those chiefly used; the copals and anime are employed in making the oil-varnishes, and the lacs and gum-mastic for spirit-varnishes. Heat is required with both kinds of solvents, and it is obtained by hot-water baths as a means of safety. Coloring matters are added to some varnishes, especially to those used on metal, as the lacquer varnish used to protect the polished surface of brass, which is colored with gamboge and turmeric. Saffron, aloes, dragon's-blood, and asphalt are also used to give yellow, brown, red, and black colors.

VARNISH TREE, a name given to several trees of the family *anacardiaceæ*, the resinous juice of which is used for varnishing or for lacquering. The BLACK VARNISH TREE (*melanorrhœa usitata*) is described in the article MELANORRHŒA; the JAPAN VARNISH TREE (*rhus vernicifera*) in the article SUMACH. Another tree, valuable for the varnish which it yields, is *stagmaria verniciflua*, a native of Java, Sumatra, Borneo, Celebes, and other East India islands. The juice is extremely acrid, and soon hardens into a black resin. To obtain it pieces of bamboo are inserted into the bark, and allowed to remain all night, as the juice flows more freely by night than by day. It sells at a high price. It is prepared for use by boiling it with equal parts of oil, obtained from the fruit of the *mimusops elengi*. The exhalations of the tree are said to be very noxious.

VARNUM, JAMES MITCHELL, 1748–89; b. Mass.; educated at Brown university and admitted to the bar. He entered the continental army in 1774 at the head of a Rhode Island regiment, and became a brig.gen. in 1777. The same year he had command of the American troops on the New Jersey side of the Delaware. He was at Valley Forge and at the battle of Monmouth, and he took part in the campaign in Rhode Island. He resigned in 1779. He was a member of congress, 1780–82 and 1786–87. He was appointed a justice of the supreme court of the North-west territory in 1788.

VARRO, "the most learned of the Romans," so called from his vast erudition in almost every department of literature, was b. 116 B.C., and educated first under L. Ælius Stilo Præconinus, and then under Antiochus, a philosopher of the academy. Varro served with distinction in the wars against the Mediterranean pirates and Mithridates; but afterward as legatus of Pompey in Spain, he was compelled to surrender his forces to Cæsar. He continued to share the fortunes of the Pompeian party till its defeat at Pharsalia, after which he solicited and obtained his pardon from Cæsar, by whom he was employed to collect and arrange the great library designed for the public. The next period in Varro's life was spent in literary retirement, chiefly at his villas near Cumæ and Tusculum. When the 2d triumvirate was formed, his name was enrolled in the list of the proscribed; but he succeeded in escaping, and, after some time spent in concealment, he was received under the protection of Octavian. The residue of his long life was spent in the tranquil prosecution of his favorite studies, rendered all the more arduous by the destruction of his magnificent library. He died in his 89th year, 28 B.C. Varro was not only the most learned, but also the most prolific of Roman authors. He himself confesses to having composed no fewer than 490 books; but only two of these have survived, and one of them in a fragmentary state. The most considerable of his writings, whether lost or extant, are as follows: 1. *De Re Rusticâ, Libri III.*, still extant, and though written in the author's 81st year, constituting the most important treatise on ancient agriculture known to us. 2. *De Linguâ Latinâ*, a grammatical work, which originally extended to 24 books, only 6 of which, however, have come down to us, and even these in an imperfect form. But for this treatise, mutilated as it is, we should be ignorant of many terms and forms, as well as of much recondite information regarding the civil and religious usages of the ancient Romans. 3. *Sententiæ*, consisting of 165 pregnant sayings strung together, not by Varro himself, but probably by different hands at different times. 4. *Antiquitatum Libri*, comprising two sections, the *Antiquitates Rerum Humanarum*, in 25 books, and the *Antiquitates Rerum Divinarum*, in 16 books. This, the greatest work of Varro, and on which his reputation for learning was mainly founded, has unfortunately perished, all but a few fragments. From the 2d section St. Augustine drew much of his well-known work, the *City of God*. 5. *Saturæ*, composed in various meters, and occasionally in prose. These pieces, copied to some extent from the productions of Menippus the Gadarene, were apparently a series of comments on a great variety of subjects, generally conveyed in the form of dialogue, and aiming at the enforcement of some moral lesson or serious truth in a familiar and even jocular style. Of these we have only fragments; and of the other works little more than the titles. The best edition of the *De Re Rusticâ* is that of Schneider (Leip. 1794–97); of the *De Linguâ Latinâ*, that of Müller (Leip. 1833).

VARUN'A (from the Sanskrit *vr'i*, surround; hence, literally, "the surrounder," and kindred with the Greek *ouranos*) is, in the Vedic mythology of the ancient Hindus, one of the *Adityas*, or offsprings of *Aditi*, the deity of space, and among these, one of the

most prominent. He is often invoked together with *Mitra*, sometimes together with *Agni*, the god of fire, or with *Indra* (q.v.), or other elementary deities; but frequently he is also separately praised by the poets of the Vedic hymns. The character of Varuna, as is the case with other Vedic deities, does not appear to have been or remained the same throughout the whole period represented by the Vedic poetry; but, on the contrary, to have varied according as new imaginations were connected with the idea out of which he arose. Originally, *Varun'a* seems to have been conceived as the sun from the time after its setting to that of its rise; while *Mitra* probably represented the sun at its rise. The night is therefore said to be Varuna's, and the day Mitra's; and the "ever-going Varuna grants a cool place of rest to all moving creatures, on the closing of the eye (of *Savitr'i*, the sun)." As a consequence, the sun, as manifest during its daily course, is spoken of as his infant, and he "prepares a path for the sun;" and the dawn, which is called the golden light of Mitra and Varuna, "goes before Varuna." Out of the mysteriousness with which night is easily endowed, and the qualities which imagination may ascribe to the luminous origin of Varuna, then probably grew the moral attributes given to this deity; for he is extolled as the guardian of immortality; as the cherisher of truth; as armed with many nooses, with which he seizes evil-doers; as the forgiver of sins, and as having unlimited control over mankind. "No one rules for the twinkling of an eye apart from him, and he witnesses man's truth and falsehood. The functions of sovereign authority which are then also attributed to him are probably a consequence of his character as protector of the good, and punisher of the wicked; but his kingly might is, in some hymns, also associated with the power, predicated of him, of "setting free the water of the clouds," or of "ruling over the waters that are in heaven and earth." Whether the connection of Varuna with the element of water arose from the association of moisture with night, or, which is more likely, from the notion that water (*vâri*, from the same radical, *vr'i*, as Varuna) envelops or surrounds the earth, as darkness does, may be doubtful; but it is worthy of notice that the passages of the R'igveda in which Varuna is spoken of as the cause of rain, or as the lord of rivers or the sea, are few, and perhaps do not belong to the earlier portion of R'igveda poetry. See, for more detail, J. Muir's "Contributions to a Knowledge of the Vedic Theogony and Mythology," in the *Journal of the Royal Asiatic Society* for 1864. Compare also the article Vasisht'ha.—It is in this latter character alone, however, that Varuna appears in the classical and Purânic mythology; for there he has ceased to impersonate the sun, when invisible, and though, at that period too, he is still mentioned as an Aditya, his real quality is that of the regent of the waters, and more especially of the ocean, personified. As such, he retains, it is true, the Vedic qualities as "lord of punishment," and carries the "noose" to bind the wicked with; these attributes, however, are, then, not the reflex of his solar omniscience and power, but that of his might as the god of water.—Later fiction makes him also the regent of the west, probably in recollection of his Vedic character as the setting sun; and endows him with a wife, *Varun'âni*, a son, *Pushkara*, and sometimes also with a daughter, *Punjikasthalî*. It further gives him for a residence the fabulous mountain, *Pushpagiri*, "the mountain of flowers," and a marine monster, *Makara*, for his vehicle.

VARUS, Publius Quintilius, a Roman of noble birth, was appointed governor of Syria, and on his return from that post, was sent by Augustus to command the armies of Germany. His instructions, also, were to introduce into that country the regular administration of a Roman province. The Germans were indignant at his proceedings, and under the leadership of a chief of the Cherusci, named Arminius (Latinized from Herman), attacked Varus, who, with three legions, the usual number of auxiliaries, and a strong body of cavalry, had proceeded as far as the Weser. By false intelligence, the proconsul was induced to quit his intrenched camp. The Romans marched in a long straggling line, encumbered with baggage, with their wives and children. Suddenly, they were assailed by the Germans in a forest, and it was with difficulty they forced their way to a clear space to encamp for the night. For the next two days the Romans struggled on, marching and fighting, with decreasing forces, and exhausted strength, intending to reach, if possible, the fortress of Aliso on the Lippe. Near Kreutzberg, they were met by the main force of the Germans, and completely broken. Varus killed himself in despair. Augustus, who was now old and weak, is said to have yielded to transports of grief, calling upon Varus to give him back his legions. This victory of the Germans was gained 9 A.D., and rolled back the tide of Roman conquest. The Rhine, instead of the Weser, again became the boundary of the empire. The battle has ever since been a proud recollection for the Germans, and is known by the name of Herman-schlacht, that is, Herman's fight.

VA'RUS is a term employed in surgery to designate a variety of club-foot (q.v.). The corresponding Latin word signifies "having the legs turned inward, knock-kneed." It may be regarded as the opposite to valgus (q.v.), and as in the case of that word, *talipes* must be understood. In the form of club-foot termed varus, (1) the heel is raised; (2) the inner edge of the foot is drawn upward; and (3) the anterior part of the foot is twisted inward, so that the patient walks on its outer edge.

VAS, the Hungarian name of Eisenburg, a co. of Hungary, in the Trans-Danubian circle, bounded by Lower Austria, Styria, and Oedenburg, Veszprém and Zola counties;

It is crossed in the w. and s. by the Alps, and drained by the Raab. The soil produces grain, wine, and fruit. It takes its name from Vasvár, a free town and fortress under Matthias Corvinus. Pop. '90, 389,854. Capital, Szombathely.

VASA, a province of Finland, Russia, on the gulf of Bothnia; 16,084 sq.m.; pop. '94, 424,438. The surface is of level plains, with few lakes or rivers. Capital, Vasa.

VASARHELY, or HÓD-MEZÖ-VÁSÁRHELY, a city of Hungary, province of Czongrád, 5 m. from the left bank of the Theiss, and 16 m. n.e. of Szegedin. It has churches, a gymnasium, town hall, banks, hospitals, breweries, and oil factory. The city is rapidly rising into prominence. Pop. '90, 55,483, actively engaged in cattle-breeding, and in the cultivation of wine and tobacco.

VASARHELY, or MAROS-VÁSÁRHELY, a handsome t. of Transylvania, the largest of what are called the Szekler towns, and the center of Szekler political life, stands on the Maros, on a fruitful plain 60 m. n.n.e. of Hermanstadt. It has broad streets and well-built houses; excellent public schools, Protestant and Catholic—the latter richly endowed; a strong castle; and a choice public library founded by count Tekeli, and containing a fine museum of natural history. Tobacco, wine, and fruit are largely cultivated. Pop. '90, 14,212.

VASARI, GIORGIO, an Italian painter and author, was b. at Arezzo, in Tuscany, in 1511. He was a pupil of Michael Angelo's, and obtained the patronage of many distinguished persons, as cardinal Ippolito de' Medici, Clement VII., and the dukes Alessandro and Cosmo de' Medici; but his pictures possess no peculiar or distinctive merit, and his reputation rests exclusively on his *Vite de' più excellenti Pittori, Scultori, e Architetti* (Lives of the most excellent Painters, Sculptors, and Architects; Flor. 2 vols. 1550; 2d ed. by Vasari himself, 3 vols. 1568). This work is written, on the whole, in a simple and honest style; at times, it is even marked by a noble eloquence. The criticism is often admirable; and in spite of frequent inaccuracies (which, indeed, have been corrected by Della Valle, Rumohr, Förster, and others), it remains a model of art criticism and biography. Vasari died at Florence in 1574.—Bohn has published an English translation of Vasari, in 5 vols., forming part of the "Standard Library" series.

VASCO DA GAMA. See GAMA.

VASCULARES, in De Candolle's botanical system, the first of the two great divisions of plants, consisting of those in which vascular tissue (q.v.) appears, and thus including all the phanerogamous plants, both endogenous and exogenous. See CELLULARES.

VASCULAR TISSUE, in botany, that kind of vegetable tissue which is composed of closed tubes or vessels, elongated cells. The tubes have membranous walls of cellulose (q.v.), and within them are juices of the plant, which often deposit secretions. They are generally almost cylindrical—although sometimes prismatical from compression—except that they taper to a point at each extremity, preserving their character as cells by being closed at the extremities. They lie close together in bundles, and often overlie one another at the ends. The principal kinds of vascular tissue are woody fiber (q.v.) and laticiferous tissue, composed of the vessels which convey the latex (q.v.). Laticiferous tissue is generally composed of branched and anastomosing tubes, the walls of which are thin and delicate, extremely so in young plants. Many varieties of vascular tissue have, however, been distinguished by botanists, of which the most important are those classed under the name of *fibro-vascular tissue*, having spiral fibers in the tubes, winding up the inside of their walls as if to strengthen them. These fibers are elastic, and the coil can often be easily unrolled, at least while the tubes are young. Many fibers are often found in a single tube.

VASE (Lat. *vas*, Ger. *fass*), a term applied, in its widest signification, to all vessels adapted either for ornament or use. It is generally used in this sense with reference to ancient art; in connection with modern art, it is restricted to vessels of an ornamental kind. Few remains of antiquity have excited more interest than vases, particularly those of Greece, and of the Greek colonies and conquests. The names given by classical writers to vessels adapted for different purposes, have not always been easily identified with the ancient vases which have been preserved to us; but according to the nomenclature of M. Gerhard, which has generally been adopted, the following are the principal varieties, classified according to their uses: 1. Vases for holding wine, oil, or water, known under the names of *amphora* and *diota stamnos*. 2. Vases for carrying water, *hydria, calpis*. 3. Vases for mixing wine and water, *crater, kelebe, oxybaphon*. 4. Vases for pouring, *oinochoë, olpe, prochoüs*. 5. Drinking cups or goblets, *cantharus, kyathus, karchesion, holchion, kyphos, kylix, lepaste, phiale, keras, rhyton*. 6. Vases for ointments or perfumes, *lekythos, alabastron, askos, bomylios, aryballos, kotyliscos*.

The materials of which vases are formed include metal, stone, glass, and earthenware.

Vases of the precious metals were in use among the ancient Egyptians. Among the Greeks and Greek colonists of Asia Minor, they were very early employed for sacrificial purposes, and those of silver were frequently chased, an art in which considerable progress had been attained at a remote period. The general improvement in design in the epoch of Phidias, told in the chaser's art, the complete development of which was, however, according to Pliny, due to Polycletus. In the later period of the Roman republic, chased silver vases were more than ever in request; but under the empire,

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VASES, ETC.—1, 2. Grecian vases of the best period. 3, 4. Roman wine-vessels. 5–10.
16. Roman marble vase. 17–19. Greek clay vases. 20–29. Vessels of the later bro

an household utensils. 11–13. Grecian household utensils. 14, 15. Roman clay vessels.
und iron period. 30. Greek metallic vase. 31. Greek earthenware vase.

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chasing fell into disuse. Bronze, iron, and lead were all used as materials for vases. Bronze vases abounded among the presents made to the Greek temples; they were generally thin and hammered out, often decorated with inlaid ornaments or reliefs, among which mythological subjects and animal heads appear, and the handle sometimes assumed the shape of the human figure. Leaden vases were chiefly used for ungents or perfumes. The gold and silver vases of the first few centuries of the Christian era were, for the most part, imitations of pagan art. In the 12th c., a style was introduced, called *damascene* work, with patterns of gold or silver wire imbedded in iron or bronze. Many vases of this kind were made by Benvenuto Cellini.

Among the mineral materials which, plain and enriched, have been used both in ancient and modern times for vases, are marble, lapis lazuli, jasper; semi-transparent stones, such as opal, girasol, agate, chalcedony, sardonyx, cornelian; as also transparent gems and rock crystal. Multitudes of vases of precious stones were brought to Rome from the conquered provinces, particularly from Asia. Those in highest esteem were the *myrrhine* vases, whose material has been the subject of dispute among antiquaries; they are described by Pliny as brilliant, gem-like, and of various colors, generally purple and white, mingled with the iridescent hues of the rainbow. Precious stones have not ceased to be a material for vases; large and costly vases of malachite and jasper are manufactured in Russia; and elaborately carved vases are still made of the white alabaster of Volterra, in Tuscany.

Glass has at all times been a favorite material for vases. Small toilet-phials of opaque glass were in use in Egypt as far back as 1450 B.C. The cameo vases of Rome, of which the Portland vase is the most celebrated example, were composed of two layers of glass, the outer of which, being opaque, was cut down into groups of figures, delicately executed in relief. About the 3d c., we have, for the first time, the *diatreta*, or bored vases, with an external veil or network, almost detached from the rest of the glass. In the 5th c. occur vases composed of two layers of glass, with gilded subjects—often figures of Christ and legends of saints—between them. Vases of green glass, of a later period, with undercut projections, bearing a rude resemblance to the diatreta, have been found in tombs in England and France. Venice afterward acquired great celebrity for its glass vases. In the beginning of the 16th c., the Venetian glass-makers introduced a class of vases enriched with white or colored filigree work, having the appearance of being incrusted in the glass. They were much sought after all over Europe; and great care was taken to prevent the secret of their manufacture from being discovered. Beautifully enameled vases were also issued from the Venetian manufactories, as well as others of grotesque forms, representing imaginary animals, and pierced with holes or constructed in the form of a siphon, which are said to have been employed by alchemists, and in pharmacy and distillation. The German manufacturers, in the 16th c., produced vases with heraldic designs and inscriptions in enamel, generally cylindrical, and sometimes of considerable size, which are much prized by connoisseurs; in the following century, the designs became more artistic; and both in Germany and Italy, it was quite usual for distinguished artists to be employed to decorate these glass vases, in imitation of rock crystal, with ornaments, and arabesques. See POTTERY.

VASELINE, or petroleum jelly, is a residue from the distillation of petroleum, prepared by filtration. It is an amber-colored, translucent, semi-solid of the consistency of butter, melts at 37° C., is slightly soluble in alcohol, and readily dissolved by ether. It does not become rancid, and is largely used in pharmaceutical preparations, especially ointments, instead of the ordinary fats; is also extensively used for toilet articles. Lately it has been used by the bakers of Paris in the place of lard, because it ferments less quickly.

VASISHT'HA (the superlative of the Sanskrit *vasumat*, wealthy) is the name of one of the most celebrated Vedic R'ishis (q.v.), the author of several hymns of the R'igveda, and a personage who seems to have played an important part in the early history of the Brâhmanic or priestly caste of the Hindus. In the account given of him, historical events and mythological fictions are so much blended together that it is scarcely possible to gather more from it, for certain, than that he was a sage of high reputation, and a priest jealous of the privileges and the position of his caste, and ever ready to assert its superiority over the second or military and royal caste. In one of his R'igveda hymns he claims to have been enlightened by the god Varun'a; and in another he is called the son of *Mitra* and *Varun'a* (q.v.), born from the mind of *Urvas'î* (see PURÛRAVAS). In other Vedic passages his pre-eminence over other R'ishis, and his acquaintance with sacred and sacrificial knowledge are extolled. In the Mahâbhârata (q.v.), which also calls him the son of Mitra and Varun'a—whence his appellation there, *Maitrâvarun'i*—he is mentioned as imparting divine knowledge to king Janaka, and as the family priest of the race of Ikshwâku; and in the Purân'as he is said to have been one of the arrangers of the Vedas in the Dwâpara age. In Manu and the Purân'as (q.v.), he becomes a patriarch, one of the nine mind-born sons of the god Brâhman; and, according to some, marries Urjâ (strength); according to others, *Arundhatî*, one of the Pleiades, by whom he has seven sons. Various other legends relating to him always endeavor to impress the Hindu mind with his Brâhmanic power over kings and Kshattriyas generally. Thus, so great was his power, as the Raghuvans'a relates, that when king Dilîpa was doomed to remain childless, because he had inadvertenty;

offended the fabulous cow Surabhi, he was released of this curse by faithfully attending on the cow of Vasisht'ha, which was the cow of plenty, and an offspring of Surabhi. But the most interesting episode of his life is that relating to his conflict with *Vis'wâmitra* (q.v.). A Vasisht'ha is also mentioned as the author of a law-book; but whether he is, or is intended to be, the same personage as the ancient sage, may be doubtful. The name is often written *Vas'isht'ha*, when it would be the superlative of *Vas'a*, meaning "the most humble"—which the epic and Purânic Vasisht'ha certainly was not—or of *Vas'in*, meaning "the sage who has thoroughly subdued his passions"—which, too, would seem to be a rather strange epithet of the irascible saint. But though the name of the owner of the cow of plenty, who could obtain anything he desired, is doubtless correctly spelled Vasisht'ha, the less correct spelling must nevertheless have been current for a considerable time, since so early a poet as Kâlidâsa (q.v.), in his Raghuvans'a, puns on the words *vas'i vas'isht'ha*, "Vasisht'ha, the sage with subdued passions."—See, for the legends concerning Vasisht'ha, J. Muir's *Original Sanskrit Texts*, vol. i. (1858).

VASQUEZ DE CORONA'DO, Francisco, 1505–42; b. Spain; came to New Mexico, which he explored. In the hope of finding treasures among the Indians, he headed an expedition which started from Culiacan on the Pacific, early in 1540, traversed Sonora, crossed the Gila, and came to the cities of Cibola. He did not, however, find the expected treasure. He sent to Spain drawings of these cities, and an account of his expedition, which contains the first description of the buffalo. On his journey back from the city of Quivera he fell off his horse and was killed.

VASSAL (Celtic, *gwâs*, a youth or page), in the feudal system, is the correlative of suzerain (q.v.). See also Feu; Feudal System.

VASSAR, Matthew, 1792–1881; b. England; emigrated to this country in 1796. He succeeded his father in the brewing business near Poughkeepsie, and acquired a great fortune, $800,000 of which he gave for the establishment and endowment of the college for women which bears his name.

VASSAR COLLEGE. A non-sectarian institution for the higher education of women, founded by Matthew Vassar, near Poughkeepsie, N. Y., in 1861, but was not fully organized until 1865. It is situated two miles east of Poughkeepsie, with which it is connected by electric cars. There are 400 acres of grounds. The college buildings comprise the main building, a structure 500 feet long, containing the chapel, library, parlors, offices, etc.; Strong Hall and Raymond House, for residence; the Vassar Brothers' laboratory of physics and chemistry; the museum, with its collections, art-galleries, music-rooms, etc.; the recitation hall; the observatory; the alumni gymnasium; the conservatory; the lodge; residences for the president and professors; and other structures. The library of the college contains some 25,000 carefully selected volumes, and has connected with it a reading-room. There are a number of endowed scholarships for the assistance of students, besides two special funds of $50,000 each, and several of smaller amounts. The regular course of study leads to the baccalaureate degree, but special students are also admitted to the different departments. The college likewise provides for graduate instruction leading to the degree of A.M. In 1897, the professors and other officers of instruction and government numbered 57; and the students (graduate and undergraduate), 543. President, the Rev. James M. Taylor, D.D., LL.D.

VASSILKOV', a t. of Little Russia, in the government of Kiev, and 18 m. s.w. of the city of that name. This town, which was founded in the 10th c., contains tobacco and soap factories. Pop. about 18,000.

VAS'TO, or Il Vasto, a t. on the e. coast of southern Italy, in the province of Chieti, 26 m. s.e. of Ortona. It stands on a rising ground facing the Adriatic, from which it is distant 1½ m., is inclosed by walls, contains a spacious square with a handsome fountain, a handsome palace, a castle, and several churches. It has manufactures of silk, woolen goods, and earthenware. Pop. '81, 13,883.

VASUDEVA and **VÂSUDEVA**. See under Vishn'u.

VATER, Johann Severin, 1771–1826; b. Saxe-Altenburg, Germany; educated at Jena and Halle. He became a distinguished linguist, orientalist, and theologian; and held professorships at Jena, 1796; Halle, 1800–9 and 1820–26; and Königsberg, 1809–20. He published important works, of which the best known are his Russian, Polish, and Hebrew grammars, and the *Literatur der Grammatiken, Lexika, und Wortersammlungen aller Sprachen der Erde.*

VATE'RIA. See Tallow Tree.

VATICAN, Palace of, in Rome, the principal residence of the pope, and the seat of the great library and the museums, and collections of art, ancient and modern, which, for visitors, constitute one of the chief attractions of the city of Rome. The popes, very soon after the establishment of the peace of the church under the emperor Constantine, had a residence at the Vatican, which they occupied, although at uncertain intervals, conjointly with that of the Lateran. For a long time, however, through the mediæval, and especially the late mediæval period, the Vatican appears to have been

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3. Mixer (Krater), Paris.

7. Stor

1. Bottle.

6. Oil Bottle (Lekythos), Athens.

2. Dodwell Vase (Corinth).

8. Oil-Vess

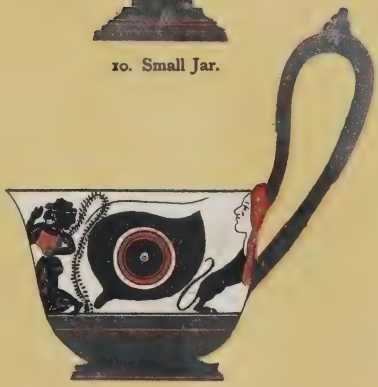
Fig. 2—10 from the colle

Jar. (Stamnos).

4. Panathenaic Amphora, Athens.

10. Small Jar.

Athens.



5. Kyathos.

9. Wine Jar.

of Vases at Munich.

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neglected. It was Nicholas V. who began that systematic scheme for the improvement and embellishment of the Vatican which has resulted in what, taken altogether, may be regarded as perhaps the noblest of princely residences. Alexander VI., Julius II., and above all, Leo X., pursued the same plan; and there are very few of the succeeding popes who have not had a share in the enlargement or embellishment of the Vatican. Amid all the difficulties, financial and political, of his pontificate, Pius IX. carried out many tasteful works of completion or restoration, the most striking and effective of which is the great stair by which it is approached from the colonnade of St. Peter's. The building, with its gardens and other appurtenances, is said to cover a space equal to the whole area of the city of Turin, such as it was thirty years ago, with a pop. of 130,000. It is popularly believed to contain 16,000 apartments of various sizes, but this is probably an exaggeration. Some of them, however, are of unrivaled beauty, among which may be particularized the chapel of San Lorenzo, the Pauline chapel, and the still more celebrated Sixtine chapel, which is decorated in frescoes from the pencil of Michael Angelo; the Sala Regia, the galleries and halls decoroted by Raphael, Giulio Romano, and their scholars; the magnificent library, which, although surpassed in the number of volumes, is unrivaled among the cities of Europe in extent, in beauty of proportions, and in decorations; the galleries of antiquities and of paintings, statuary, etc. The library was opened for historical research, under certain conditions, by Leo XIII. in 1883. Many descriptions of the Vatican have been published, and are to be found in all great libraries. An extremely interesting account, historical and descriptive. is to be found in Donovan's *Rome, Ancient and Modern;* see also Hare's *Walks in Rome*, and for recent additions and changes, Murray's *Handbook of Rome.*

VATICAN CODEX, one of the most valuable manuscripts of the Greek Scriptures, in uncial letters, belonging to the 4th century. Its marks of antiquity are the same as those of the Sinaitic codex, and the characters in both are very much alike. It is written on fine, thin vellum in beautiful square letters. It contains a large part of the Old Testament, and the New as far as Hebrews ix, 14. It has been in the Vatican library about three centuries. An edition prepared by cardinal Mai was published in 1857, after his death, but was found to be very erroneous. A new edition is now in progress under papal authority in beautiful style. The size and shape of the manuscript are preserved; and the printing is from the type cast for the imperial Russian edition of the Sinaitic codex.

VATICAN, COUNCIL OF THE (see COUNCIL). In 1867, more than 300 years after the council of Trent, Pope Pius IX. announced his purpose of holding another, the 20th ecumenical council. The period between this announcement and the publication of the pope's encyclical (June 29, 1868), definitely summoning the council, was replete with controversy regarding it, nor did the controversy become mute till the very date of the meeting. The liberal parties in the church, specifically the Jansenist, Gallican, and Old Catholic parties, as opposed to the Jesuitical and Ultramontane section —who were opposed to the subordination of the state to the church and of councils to the pope, vigorously contested the expediency of holding a council. Many of the prelates and of the general body of the clergy, especially of France, Belgium, Germany, and Holland, as well as many Catholic statesmen, gave voice to their opposition. Notably the court of Bavaria, under the inspiration of Dr. Döllinger, the leader of the Old Catholic party, combated the proposition in a vigorous circular addressed to Roman Catholic courts, showing the political bearings of the question. Austria united in discountenancing the projected meeting, and although Napoleon III. was not indisposed to it within certain limits, his ministry generally regarded it with distrust. Montalembert from his dying bed issued a voice of warning in opposition. The government of Italy opposed it openly. On the festival of the Immaculate Conception, 1869, amid thunders of artillery from San Angelo, and universal ringing of church bells the council held its first session in the basilica of the Vatican. There were present 719 prelates, 49 of whom were cardinals, 9 patriarchs, 4 primates, 121 archbishops, 479 bishops, and 57 abbots and generals of monastic orders This number gradually rose to 764, which was the greatest number of the 1,031 members invited who attended any one session. The deliberative sittings of the council, whether of the committees, or deputatory, or of the general congregation, were strictly private, but four public sessions were held at different times, when the decrees of the council were solemnly promulgated.

The subjects for discussion had been distributed by preparatory commissions under four heads (faith, discipline, religious orders, rites, including missions), each assigned to a separate committee of 26 members presided over by a cardinal; the reports of these committees on each specific point being laid before the general congregation, discussed, revised, adopted, and then, in public session and in presence and by authority of the pope, proclaimed to the public. Although the doctrine of infallibility had not been formally announced as a portion of the programme of the council till its actual convention, yet it may be said that the council had but two real objects. The solemn ratification of this dogma, and the utterance of a protest against infidelity in all its aspects, whether of rationalism, pantheism, materialism, or atheism. While the decrees setting forth the doctrines of the church regarding God, the creation, the relation of faith to reason, etc., were unanimously adopted in the third public session, April 24

1870, the decision in regard to infallibility was not arrived at so harmoniously, and not till a much later period.

It had been arranged that the committee on faith should consider all other matters lying within its sphere, relating to the church, before treating of its head and his prerogatives, but, April 29, the Italian bishops addressed a collective note to the council urging that all questions should give way to that of papal infallibility. The pope approved of this change, and ordered an inversion of the order of business accordingly. The debates on the subject agitated the council for some months, and the first vote was not arrived at till July 11, when, out of a court of 601 members, 88 voted "*non placet,*" or adversely. Influences were brought to bear on the non-conforming members, and these, combined with the threatened outbreak of the Franco-Prussian war, led many either to return to their dioceses, or, at least, to refrain from further attendance on meetings at which a vote was taken. On the final vote on the question, July 18, 1870, only two anti-infallible prelates recorded their votes; and even these, with all the rest of their recusant brethren, did ultimately, for the sake of unity and peace, acquiesce in the decrees of the church, henceforward known as the "Vatican decrees."

The decision on this matter arrived at by this great council may be summarized as follows: "The pope is superior to all councils; he is bishop of bishops, they being his vicars as he is vicar of Christ; when speaking on questions of faith and morals he is infallible, and his decisions irreformable and irreversible." A decision of such historic significance and so far-reaching in its consequences has not been issued by any former council: by it the Jesuits and Ultramontanes have gained a triumph absolute and decisive over their liberal opponents; but the ultimate fruits of such a victory can be developed only with the process of the ages. In the mean time it may be noted that it has placed the church and the government of Germany in direct antagonism, and one of the first results of the victory of the Jesuits was to procure their own expulsion from that country. The council was adjourned and indefinitely postponed, Oct. 20, 1870, in consequence of the outbreak of the Franco-Prussian war.

VATICAN DECREES. See VATICAN, COUNCIL OF THE.

VATTEL, EMERICH, a well-known writer on the law of nations, was born at Couret, in Neufchâtel, Apr. 25, 1714. His father, a Protestant clergyman, had been ennobled by the king of Prussia, whose subject he was. Vattel studied for the church at Bâle and Geneva, but he devoted greater attention to the writings of Leibnitz and Wolf than to those of the Calvinistic divines; and instead of becoming a country clergyman, he resolved to push his fortune at the court of Berlin, as a man of letters and diplomatist. In 1741 he offered his services to Frederick II., who had just ascended the throne, but there was then no vacancy in the public service. Three years afterward, he received an appointment at Dresden from the elector of Saxony, then also king of Poland; and in 1749 he was Saxon ambassador to Bern. In this post, he had ample leisure, and devoted himself to literary pursuits. He published, in French, under different titles, collections of essays on miscellaneous subjects, which are lively, and well written. But his chief attention for ten years was bestowed on his great work, the *Droit des Gens; ou Principes de la Loi Naturelle appliqués à la Conduite et aux Affaires des Nations et des Souverains.* This title sufficiently explains the scope of the work. It contained little that was new, but it abridged and systematized the doctrines of Grotius, Puffendorf, and Wolf. Vattel had, however, that skill in arranging his materials, and that power of lucid expression, which so often characterize French men of letters; and his book became rapidly popular as a text-book of international law. Like all his predecessors in the same field, Vattel based his whole system on an imaginary law of nature, and it would be easy to enumerate a large number of false conclusions to which he came in the absence of the light thrown on the law of nations by practice, and by the principle of utility in our time, so generally adopted as the test of international morality. After the completion of his great work, Vattel was recalled to Dresden, where he married, in 1764, Marianne de Chêne, and was promoted to the rank of privy-councilor. The duties of his new post proved too arduous, and he died of over-work on Dec. 28, 1767. Mr. Chitty republished, in 1833, an English translation of Vattel, with notes.

VAUBAN, SEBASTIEN LE PRESTRE, Marshal of France, the celebrated military engineer, was born at Saint Leger de Fougeret, in the dep. of Nievre, May 15, 1633; and being left an almost destitute orphan at the age of ten, his education was carried on under the auspices of the *curé* of his village. Leaving Saint Leger in 1651, he set out on foot to join Condé's army, then on the Belgian frontier; and during two years of active field service, obtained large insight into the engineering methods then in practice. Taken prisoner in 1653, he joined the royalists, and during the succeeding contest was mostly attached to the army of Turenne, who intrusted him with the sole control of the besieging operations; and the powerful assistance which the extraordinarily rapid reduction of the enemy's strongholds gave to the king's little army, gained for Vauban the repute of being the most promising young engineer of the time. On the conclusion of peace in 1660, he was dispatched to the w. to demolish the rebel strongholds in Lorraine, and to take charge of Breisach; but in 1667 he appeared again in the n., capturing one after another the powerful defenses of the Belgian frontier. About this period, the all-

powerful Louvois, charmed by Vauban's probity, punctuality, and habits of cool calculation, no less than by his genius, took him firmly by the hand; and it was as much owing to the great minister's favor as to the superiority of his designs that Vauban was preferred to the highly honorable and important office of fortifying the Flemish fortresses which had fallen into the possession of France. This labor accomplished in 1672, and the war with Holland resumed, Vauban took his old place as director of the siege operations, and for the first time introduced into practice in western Europe the method of approach by parallels (recently borrowed from the Turks), at the siege of Maestricht (1673), and with such effect, that that strong fortress capitulated in thirteen days. After tracing the plan of siege for Treves, and with remarkable sagacity foretelling the date when it *must* fall, he set himself with energy to strengthen the newly-acquired fortresses in the low countries, and closed a long and brilliant array of services for 1674 by throwing himself into Oudenarde, where William of Orange besieged him in vain. In 1675 he inaugurated a new era in military tactics by obtaining the creation of a corps of engineers, though the completion of the innovation by the establishment of companies of sappers was denied him. In 1676, he conducted the remarkable sieges of Valenciennes and Cambrai, stormed the latter in open day, against the unanimous opinion of the generals of the army; and two years later was rewarded for his long and glorious services by the appointment of director-general of fortifications. This post gave him the supreme control of the department of military engineering, and the ten years of peace which followed 1678 supplied opportunity for Vauban's rendering to France perhaps the greatest of his services, in surrounding the kingdom with a complete cordon of fortresses, fitted either for defense or for commanding weak points of the neighboring countries. At intervals during this period, he captured the almost impregnable fortress of Luxembourg, and planned and partly executed the magnificent aqueduct of Maintenon, by which the waters of the Eure are conveyed to Versailles.

War breaking out again in 1688, Vauban conducted the sieges of Philipsburg, Mannheim, and Frankenthal (introducing, at the last, his invention of ricochet-firing) Mons, (1691), and Namur (1692), with his usual success, though opposed at the last-named place by his great rival, Cohorn, who had fortified, and who defended it. After this period, Vauban almost disappears from the field of warfare, on which he had stood invincible for so many years, for the sieges of Charleroi (1693), Ath (1697), Breisach (1704), and the construction of the intrenched camp near Dunkirk (1706), are the only professional works of importance during the last 14 years of his life. After the peace of Ryswick in 1697, he had applied his active practical mind to the consideration of various deficiencies and anomalies in the internal government of France; and his zeal and research brought together a large mass of information and suggestion on numerous subjects, which was published under the curious title of *Oisivetés de M. de Vauban*, and contained recommendations for the collection of statistics of population, commerce, and agriculture, for supplying the army by recruitment, and valuable suggestions for improving the soil by drainage, etc., etc. Another of his works which excited an immense sensation at the time was the *Dime Royale* (1707), in which he discussed the question of taxation, and anticipated in the most striking manner the doctrines which, a century later, overthrew the French monarchy: such principles promulgated by a man of Vauban's sterling integrity and profound practical wisdom, could not be expected to be very palatable to the king and court of whose conduct they furnished indirectly the severest censure; and we are not therefore surprised to learn from Saint-Simon "that the marshal de Vauban was very ill received when he presented himself," and that, by an edict of Feb. 14, 1707, his book was seized and confiscated. Vauban did not long survive his disgrace, dying at Paris, Mar. 30, 1707. Fontenelle calculates that he had constructed 33 new fortresses, repaired 300 old ones, conducted 53 sieges, and had been present at 140 "actions of vigor;" and in his practice, the capture of a fortress was certainly a mere question of time and powder. His various professional works on the attack and defense of places, and on mines, have been collected under the title of *Œuvres Militaires* (Paris, 1796); and besides these we have various other memoirs on professional subjects from his pen. Historical notices and eulogies of Vauban are abundant in French literature. See *Nouvelle Biographie Générale.*

VAUCANSON, Jacques de, 1709–82, b. France; studied mathematics, and produced several curious mechanical inventions. Among them were a flute-playing automaton, and a duck that swam, quacked, etc., and could apparently digest its food. In 1741 he was made inspector of silk factories, and while in that position invented useful machines for dressing and weaving silk.

VAUCLUSE, a department in the s.e. of France, bounded on the w. by the Rhone, and on the s. by the Durance, which separates it from the department of Bouches du Rhone. Area, 1370 sq.m.; pop. '96, 236,313. The Rhone is the great river and its affluents, with the exception of the Durance, are all small. The department is traversed in the e. by spurs of the Alps. The plains are all in the w.—the chief being those of Orange, Carpentras, and Cavaillon. In the e., the mountains are separated by narrow, torrent-plowed valleys; and the summits, the chief of which is Mont Ventoux, 6,270 ft. high, are arid and bare. The climate is healthy and temperate, although sub-

ject to great variations—the winds from the n. and n.e. being sometimes very violent. The department, though more agricultural than manufacturing, does not produce cereals in great quantity; but the peach, pear, prune, almond, and fig trees bear excellent fruits. Olive, mulberry, and orange trees are quite common. Wines and honey, both held in high esteem, are produced. There are four arrondissements—Avignon, Apt, Carpentras, and Orange. Avignon is capital.

VAUD (Ger. *Waadt*), a canton which forms the western corner of Switzerland between the Jura and the Bernese Alps. Area, 1244 sq.m.; pop. '94, 256,242. It is a comparatively level district, traversed, however, by an elevated tract known as mount Jorat, from which plains slope on either side to the lake of Geneva on the s., and the lake of Neufchâtel on the north. On both sides, near the mountains, there are extensive pasture-lands, but the greater part of the country is highly cultivated. The orchards and vineyards are very extensive, the latter yielding white wines of excellent quality. Music boxes and watches are manufactured, and there are salt works. It is now traversed by railways, which connect it in two directions with France, and in three with the rest of Switzerland. It forms part of French Switzerland, the dialect spoken being the Vaudois. The religion is Protestant. Vaud has formed, since 1830, a democratic republic, the council of the canton being elected and controlled by the people. In 1845 and 1861 the rights of the people were still further extended. Vaud, after the fall of the Roman empire, formed part of the Burgundian kingdom. In the 13th c. it became a dependency of Savoy, to which it was annexed in 1359. In 1476 the house of Savoy took part with the duke of Burgundy in his struggle with the Swiss; and on his defeat, a part of Vaud was annexed to the adjoining cantons. In 1536 the Bernese took possession of the whole of Vaud, which they divided into 15 parts, administered by *baillis*, appointed at Bern. The nobility became patricians of Bern, and in this way acquired great influence. Still, the local councils had the power of appointing magistrates and administrative officers, which, to some extent, tempered the aristocratic character of the government. The French invasion put an end to the rule of Bern, and Vaud became a separate canton. The government remained in the hands of the higher classes until June, 1830, when a new constitution, granting a vote to every adult *bourgeois* of good character, was obtained from the council. The existing democratic-representative constitution dates from 1845. The Vaudois are industrious and well educated: and from this part of Switzerland come a large number of the Swiss teachers and governesses who are met with in all parts of the world. Capital, Lausanne (q.v.).

VAUDEVILLE, originally a popular song with words relating to some story of the day; whence it has come to signify a play in which dialogue is interspersed with songs of this description, incidentally introduced but forming an important part of the drama. The German *liedertafel* is a somewhat similar composition. The name vaudeville is a corruption of Vaux de Vire, the name of two picturesque valleys in the Bocage of Normandy. One Olivier Basselin, a fuller in Vire (q.v.), composed about the middle of the 15th c. a number of humorous and more or less satirical drinking-songs, which were very popular, and spread over France, bearing the name of their native place (Les Vaux de Vire). As the origin of the term was soon lost sight of, it at last took its present form. In the 16th c., Vauquelin still names such pieces Les Vaux de Vire.

VAUDOIS. See WALDENSES.

VAUDREUIL, a co. in s.w. Quebec, having the St. Lawrence river and the island of Perrol on the s.e., and the lake of Two Mountains on the n.; 182 sq.m.; pop. '91, 10,792. Co. seat, Vaudreuil.

VAUDREUIL, LOUIS PHILIPPE, DE **RIGAUD**, Marquis de, 1724–1802; b. France; entered the navy. He was in command of a vessel in the fight between Byron and D'Estaing near Granada in 1779, and that with Rodney near Martinique in 1780. He was in command of a squadron in the action between De Grasse and Graves, and in that with Rodney in 1782. He sat in the states general in 1789. He escaped to England, where he remained during the reign of terror.

VAUDREUIL, PHILIPPE DE **RIGAUD**, Marquis de, 1641–1725; b. France, of ancient family. He entered the army, and in 1687 was sent to Canada, then ranking as brig. gen.; he led expeditions against the Senecas, Oneidas, and other Indians in general with success. In 1698 he became governor of Montreal, and in 1703 governor-general of Canada. In this position he showed great executive ability, and defeated a naval expedition sent against Quebec.

VAUDREUIL, PIERRE DE **RIGAUD**, Marquis de, 1698–1764; b. Quebec, Canada; son of Philippe. He entered the French army, and in 1733 was appointed governor of the Trois Rivières. He became governor of Louisiana in 1742, succeeded to the title in 1748, and was made governor general of Canada in 1755. He vigorously resisted the attempts of Wolfe to capture Quebec; but, receiving no assistance from France, was forced to surrender. An official examination in France vindicated his conduct.

VAUGHAN, BENJAMIN, LL.D., 1751–1839; b. Jamaica; educated at Cambridge university, England; studied both law and medicine. He was a member of parliament, 1792–96. Dr. Vaughan wrote *The Rural Socrates*, and translated Poivre's *Travels of*

a Philosopher. He emigrated to this country, and accumulated a fine library, a large part of which he gave to Bowdoin college, near which he lived for the last 29 years of his life.

VAUGHAN, Charles John, d.d.; b. England, 1816; studied at Rugby school under Dr. Arnold; graduated Cambridge, 1838; fellow of Trinity, 1839; ordained in the church of England; had the living of St. Martin's, Leicester, 1841–44; head-master of Harrow school, 1844–59; vicar of Doncaster, 1861–69; chancellor of York cathedral, and chaplain in ordinary to the queen. He is one of the leaders of the "broad church," and distinguished as a preacher and commentator. He has published many volumes of sermons and expositions.

VAUGHAN, Henry, 1621–95; b. South Wales, entered Jesus college, Oxford, 1638; became a student at law at the Inns of Court, and studied medicine in London, withdrawing subsequently to his native place, Newton, in South Wales, where he became an eminent physician; also cultivating his favorite studies, and writing poetry on various subjects, chiefly devotional. The ancient inhabitants of South Wales were called "the Silures," and coming from that region, he adopted the name of "the Silurist," a name since received into the nomenclature of modern geology. Among his works which have been republished in our own day are *Poems with the Tenth Satyre of Juvenal Englished* (1646); *Olor Iscanus* (1651); *The Mount of Olives, or Solitary Devotions* (1652); *Thalia Rediviva* (1673). His verse, sometimes harsh, has a frequent charm of quaintness and a delicate force.

VAUGHAN, Robert, d.d., b. England, 1795; educated for the ministry at Bristol college; minister of Independent chapel, Kensington; professor of history in London university, 1830–42; president of the Independent college at Manchester, and professor of theology, 1842–57; the projector of the *British Quarterly* and its editor, 1845–65. His chief works are: *Life and Opinions of John de Wycliffe, D.D.; Memorials of the Stuart Dynasty; Causes of the Corruption of Christianity; The Protectorate of Oliver Cromwell; History of England under the House of Stuart; History of Revolutions in England; Memorial of English Nonconformity*. He d. 1868.

VAUGHAN, William, 1703–46; b. N. H.; graduated at Harvard, 1722. He was largely interested in the Newfoundland fisheries; took part in the Louisburg expedition of 1745, acting as lieut.col. of militia. Feeling slighted in the distribution of rewards, he went to England to present his claims, and there died.

VAULT, an arched roof, usually constructed of stone or brick-work. The simplest kind of vault is the plain wagon or tunnel vault, being a simple segmental or semicircular arch, thrown across a longitudinal apartment, and extending from one end to the other. Ordinary bridges show an example of this style of vaulting. Such vaults were commonly used by the Romans, who also built vaults with *groins*—i.e., vaults intersecting one another. See Groined Vaulting. The tunnel arch, of a pointed form, was of very ancient introduction, having been used by the Assyrians for vaulting their large drains.

The Egyptians are also said to have been acquainted with vaulting; but the earliest remains of ancient vaults of any magnitude are Roman works.

The Roman vaults, where groined, are usually constructed with carefully cut stone, so as to prevent the angle from chipping. The mediæval architects had not the costly materials or skill of the Romans at command, so they formed the groins only of dressed stone, and the filling in of the vault with commoner materials. This led to the groin becoming a prominent feature in mediæval architecture, being generally ornamented with moldings and carved work. We have already traced the progress of Gothic vaulting under the heads Gothic Architecture, Fan-tracery Vaulting, Rib, etc. Domical or hemispherical vaulting was also much used by the Romans. The Pantheon, in Rome, is the finest example remaining, being a circular building with a dome 142 ft. in diameter. Roman domes and vaults are frequently ornamented with sunk panels. During the renaissance period vaulting in great measure gave place to wooden roofs; but when employed, the domical or plain groined vaults of Roman architecture are chiefly used. In modern works vaults and arches are gradually becoming superseded by the use of iron construction, both for roofs and for supporting floors, bridges, etc.

VAULTING-SHAFT, a small column, or pillar, supporting the ribs of a Gothic vault. These shafts generally occur in clusters, and may either spring from the ground, or be supported on small corbels in the wall.

VAUMURE, in old fortresses, a low work under the wall in the nature of a *fausse-braye*.

VAUQUELIN, Jean, a French poet, was b. in 1535, of a noble family, at the château of La Fresnaye, near Falaise. He made a pretense of studying law at Poitiers, Paris, and at Bourges, but really spent his time in gayety and verse-making. He finally became president of the *présideal* bench at Caen, where he died in 1607. His *Œuvres Poétiques* contain many sportive songs and other light pieces, which are yet read with pleasure. He was the first writer of idyls in French verse, and is considered as the real founder of French satire, which he redeemed from the grossness that had hitherto characterized the productions that went under that name.

VAUTIER, Benjamin, b. Switzerland, 1829; studied art in Düsseldorf; became distinguished for his *genre* pictures of life in Switzerland and Swabia. Previous to 1864 he exhibited "Devout Singers in a Church;" "A Party embarking on a Rhine Steamer," etc. "Cats in a Criminal Case" is considered one of his best productions. At the Paris exhibition of 1867, where he exhibited his "Courtier and Peasants in Würtemberg," he received a medal. Among his latest works are "A Public Dinner;" "A Village Funeral," 1871; "Alsatian Woman," 1882; and "Abandoned," 1892.

VAUX, Calvert, b. London, 1824, educated in that city; came to the U. S. at the request of A. J. Downing, 1850, and practiced at Newburg with the latter till his death, 1852, and afterwards alone. In conjunction with F. L. Olmsted, Mr. V. prepared the design for the Central Park; in 1865 made a special report on the existing boundaries of Prospect Park, Brooklyn, which led to an entire change in its scope and character and the acceptance of his general scheme for its arrangement. In 1873 he was employed by the Canadian government to prepare the design which was executed for laying out the grounds and terraces of the Parliament buildings at Ottawa. He also designed the museum of natural history and the Metropolitan museum of art, in New York, and other notable buildings elsewhere. He d. in 1895.

VAUX, Richard, b. Philadelphia, 1816; son of Roberts V.; was recorder of his native city, 1842–49, mayor, 1856–58, and member of Congress, 1890–92. Although he held no office for many years, he was always a prominent democratic politician. He published a number of addresses, lectures, papers on social science, historical, humorous, and critical essays, and legal reports, and was well known as a penologist.

VAUX, Roberts, 1786–1836; b. Philadelphia, a member of the society of Friends. He was for a short time before his death judge of the county court. Most of his life was devoted to charity, to education, and to the reform of the penal code. He was an advocate of the so-called "separate system" of punishment. Among his works are: *Memoirs of the Life of Anthony Benezet* (1817); and *Notices of the Original and Successive Efforts to Improve the Discipline of the Prison at Philadelphia* (1826).

VAUX, William Sandys Wright, b. England, 1818; educated at Westminster and Oxford. He entered the department of antiquities in the British museum in 1841; was made keeper of the department of coins and medals in 1861, and resigned in 1870. Among his works are: *Nineveh and Persepolis; Persia, from the Earliest Period to the Arab Conquest* (1875); and *Greek Cities and Islands of Asia Minor* (1877). He d. 1885.

VAUXHALL', a famous public garden in London, constituted as such immediately after the restoration (May, 1660), and supporting that character for nearly two centuries. It was situated in Lambeth, opposite Millbank, and near the manor called Fulke's Hall (the residence of Fulke de Breauté, a follower of King John), from which is derived the name Vauxhall. Pepys, writing May 28, 1667, describes the garden, and concludes that the entertainments there to be had are "mighty devertising." But the pastimes of Vauxhall were not always of a merely "devertising" description. The eating, drinking, dancing, and flirtation that continually went on there led to much quarreling and dissipation.

VA'VASOUR, or Valvassor (derived, like *vassal*, from Celtic *gwâs*, a youth or page), a term of feudal times, more in use in the continent of Europe than in England, employed somewhat loosely, and defined by Camden as the rank next below a baron. Its usual meaning was one who held his lands, not directly of the crown, but of one of the higher nobility. In this class were comprehended the *châtelains*, who owned castles or fortified houses, and possessed rights of territorial justice.

VÂYU (from the Sanskrit *vâ*, blow), the wind, is, in the Vedic mythology of the Hindus, a deity, which originally seems to have held an equal rank with Indra (q.v.), but much more rarely occupies the imagination of the poets than this god, or Agni, or the sun; for though, according to Yâska (q.v.), ancient commentators of the Vedas hold that there are only three great deities—viz., *Agni*, fire, whose place is on earth; *Sûrya*, the sun, whose place is in heaven; and *Vâyu*, or *Indra* (q.v.), whose place is in the intermediate sphere—only a few hymns, comparatively speaking, are dedicated to Vâyu, whereas the other deities named are the subject of manifold praise. The description given by the R'igveda of the greatness of Vâyu nevertheless answers the position which those ancient commentators assign to him.—See J. Muir's "Contributions to a Knowledge of the Vedic Theogony and Mythology," in the *Journal of the Royal Asiatic Society* for 1864. In the epic and Purânic mythology, Vâyu occupies but an inferior position, and the legends there related of him have no cosmical character. They give him a wife, *Anjanâ*, by whom he has a son, the monkey *Hanuman* (q.v.).

VAYU-PURÂN'A. See Purân'a.

VEDA (from the Sanskrit *vid*, know; kindred with the Latin *vid-*, Greek *id-*, Gothic *vait-*, Lithuanian *weizd-;* hence, literally, knowledge) is the technical name of those ancient Sanskrit works on which the first period of the religious belief of the Hindus is based. See India, sec. *Religion*. The oldest of these works—and in all probability the oldest literary document still existing—is the *R'igveda;* next to it stand the *Yajurveda* and *Sâmaveda;* and the latest is the *Atharvaveda*. The first three also bear the collective title of *trayî*, or "the threefold" (scil. science); and all four are considered to be of

divinely inspired origin. Each of these Vedas consists of two distinct divisions—a *Sanhitâ*, or collection of *mantras*, or hymns; and a portion called *Brâhman'a*. A *mantra* (from *man*, think; hence, literally, the means by which thinking or meditation is effected) is, as Colebrooke, in conformity with the Mîmânsâ writers, defines the word, a prayer, or else a thanksgiving, praise, or adoration addressed to a deity: it declares the purpose of a pious act, or lauds or invokes the object; it asks a question, or returns an answer; either directs, inquires, or deliberates, blesses or imprecates, exults or laments, counts or narrates, etc. Sometimes it is addressed to the deity with a verb in the first person; sometimes it ends with the verb "thou art," or with the word "thee." See Colebrooke, *Miscellaneous Essays*, i. p. 308; Müller, *Ancient Sanskrit Literature*, p. 343; Jaiminiyanyâyamâlâvistara, as quoted in Goldstücker's *Pân'ini*, p. 69. If such a *mantra* is metrical, and intended for loud recitation, it is called *R'ich* (from *r'ich*, praise)—whence the name *R'igvedâ*, i.e., the Veda containing such praises—if it is in prose, and then it must be muttered inaudibly, it is called *Yajus* (from *yaj*, sacrifice; hence, literally, the means by which sacrificing is effected); therefore, *Yajurveda* signifies the Veda containing such *yajus*. And if it is metrical, and intended for chanting, it is termed *Sâman;* whence *Sâmaveda* means the Veda containing such sâmans. (The original meaning of the latter word is obscure. Native grammarians derive it, but without much probability, from *so*, to give pain, because, they say, "it is difficult to utter such mantras." A mystical, but grammatically impossible, account of *sâman* is given in the *S'atapatha-brâhman'a* and *Br'ihadâran-yaka*, where the word is analyzed into *sâ* and *ama*, the former being interpreted as implying "speech," and the latter "breathing forth," since the chanting of the sâman, as the commentator says, is essentially the result of both.) No special name is given to the mantras of the fourth Veda. The author of the mantra, or, as the Hindus would say, the inspired "seer," who received it from the deity, is termed its *R'ishi* (q.v.); and the object in which the mantra is concerned is its *devatâ*—a word which generally signifies "deity," but the meaning of which, in its reference to the mantras, must not always be taken literally, as there are hymns, in which not gods or deified beings, but, for instance, a sacrificial post, a remedy against bad dreams, the generosity of princes from whom gifts were received by the authors, or a chariot, a drum, weapons, the charioteer and horses employed in war, and other worldly objects, invoked, are considered as the *devatâ*.—See Colebrooke's *Misc. Essays*, i. p. 22; Wilson's *Rigveda*, vol. i., in the edition of F. E. Hall, p. 347.—*Brâhman'a*—derived from *brahman*, neuter, probably in the sense of prayer or hymn (see concerning this word, J. Muir, "On the Relation of the Priests to the other Classes of Indian Society in the Vedic Age," in the *Journal of the Royal Asiatic Society* for 1864; and the introduction of M. Haug's edition of the Aitareya Brâhman'a vol. i. p. 4)—designates, according to *Mâdhava-Sâyan'a*, the great commentator on the Vedas, that portion in prose of the Vedas which contains either commandments or explanations; or, in other words, which gives injuctions for the performance of sacrificial acts, explains their origin, and the occasions of which the mantras had to be used, by adding sometimes illustrations and legends, and sometimes also mystical and philosophical speculations. The *Brâhman'a* portion of the Vedas is therefore the basis on which the Vedic ritual rests (see KALPA and VEDÂNGA), and whence the *Upanishads* (q.v.) and the philosophical doctrines (see SANSKRIT LITERATURE) took their development.

Though *Mantras* and *Brâhman'as*—both of which are also termed *S'ruti* (q. v.)—were held at a later period of Hinduism to have existed simultaneously, that is, from eternity, it is certain that the Brâhman'a portion of each Veda is posterior to at least some part of its Sanhitâ, for it refers to it; and it scarcely requires a remark that so great a bulk of works as that represented by both portions must have been the gradual result of a considerable period of time. There is, indeed, sufficient evidence to prove that various conditions of society, various phases of religious belief, and even different periods of language are reflected by them. The difficulty, however, critically to discern these periods, is enhanced by the losses, probably considerable, which these writings suffered before they were preserved in the shape in which we now possess them. For in tradition, which records that *Vyâsa* (q.v.), after having compiled and arranged the Vedas, handed each of them to four disciples, and that these disciples taught them to their disciples, and so forth, down to distant ages, there is so much indubitable, that Mantras and Brâhman'as had to pass through a large number of S'âkhâs, or schools, and that the discrepancies which gradually arose between these schools, both as regards the Vedic texts and the interpretation of these texts, cannot have been slight; for, apart from the conclusion yielded by a comparison of the remaining texts of some of these schools, later writers afford us an insight into the animosity which existed between these schools, and must have arisen from very material grounds. Thus, in a commentary on *Páraskara's Gr'ihya Sútras*, it is said: "Vasisht'ha declares that it is wrong to follow the rules of another S'âkhâ." He says: "A wise person will certainly not perform the duties prescribed by another S'âkhâ; he that does is called a traitor to his S'âkhâ. Whosoever leaves the law of his S'âkhâ, and adopts that of another, he sinks into blind darkness, having degraded a sacred R'ishi." And in another law-book it is said: "If a man gives up his own customs, and performs others, whether out of ignorance or covetousness, he will fall, and be destroyed." And again in the *Paris'ish't'a* of the *Chhandogas:* "A fool who ceases to follow his own S'âkhâ, wishing to adopt another one, his work will be in vain."—See Müller's *Ancient Sanscrit Literature*, p. 51. That each *S'âkhâ* claimed

the possession of the only true and genuine Veda, may be already inferred from passages like these. The difference between these S'âkhâs, however, did not consist—as has been believed—in their various readings of the S'ruti alone: it also consisted in considerable variations of their arrangement of the Scriptures; in their additions or omissions of texts—as may be seen from still existing S'âkhâs of the Yajurveda—and, as is stated by *Madhusûdana*, and results from a commentator on Pân'ini, in their *different interpretation of the Vedic texts*. How great the number of these S'âkhâs was, may be inferred from the statement of the *Charan'avyûha*, a treatise ascribed to an ancient writer, S'aunaka; for it enumerates five S'âkhâs of the R'igveda; says that there were 86, and names 42 (or in one recension 44) of the Yajurveda; mentions twelve of the Sâmaveda, out of a thousand, which, it says, were at one time in existence, and nine of the Atharvaveda. The *Atharvan'arahasya*, a modern treatise on the Atharvaveda, while ascribing the same number of Sâkhâs to the Sâmâveda and Atharvaveda, speaks of twenty-one of the Ri'g-veda, and a hundred of the Yajurveda. Of all these schools, however, the *R'igveda* is now extant only in one; the *Yajurveda* (both divisions to be named hereafter, taken collectively) in three and partially in four; the *Sâmaveda* in perhaps two; and the *Atharvaveda* in one.

The character of the Sanhitâ or Mantra portion of the four Vedas—on which their Brâhman'a portion is based—as well as the relation in which these Sanhitâs stand to each other, is intelligible only if it is borne in mind that the ancient Hindu believed to secure the favors of his gods chiefly by the performance of sacrificial rites; that gradually these rites became complicated and manifold, and that special care, therefore, had to be taken to provide for a correct celebration of the sacrifices which had sprung up, and also to guard against the evil consequences which might result from inadvertence, or other causes beyond the sacrificer's control. The original worship seems to have been simple enough (see INDIA, sec. *religion*)—it probably neither occupied much time, nor required the assistance of a priest. But when sacrifices were instituted which lasted from one day to eleven, nay, to a hundred days—and some works speak of sacrifices which went on for the space of one and even several years—and when the Brahmanic caste found the performance of such sacrifices to be an excellent means of establishing its sway over the other castes, and a convenient source of an easy livelihood, it was laid down as a rule that no sacrifice could be performed without one *R'itwij*, or priest; and that a great sacrifice, such as the Jyotisht'oma, Râjasûya, or other sacrifices which could only be celebrated by wealthy people or kings, required the assistance of not less than sixteen priests, besides a number of menials, who had to slay the sacrificial animals, to chant, or to perform other inferior work. These sixteen priests were then divided into four sections, each headed by one R'itwij, and containing besides him, his three purushas, or assistants. The first section consisted of the *Adhwaryu*, with his three purushas, the Pratiprasthâtr'i, Nesht'r'i, and Unît'ri; the second, of the *Brahman*, with the three purushas, Brâhmanâchchhansin, Agnîdh (or Agnîdhra), and Potr'i; the third, of the *Udgâtr'i*, with the Prastotr'i, Pratihartr'i, and Subrahman'ya; and the fourth of the *Hot'ri*, whose assistants were the Maitrâvarun'a, Achchhâvâka, and Grâvastut. (In other accounts the order of these sections varies, and in the section headed by the Brahman, the Potr'i precedes the Agnîdh; see also Müller, *Ancient Sanscrit Lit.*, pp. 468–69; where, however, by mistake, some of the assistant priests occur in the wrong sections.) The principal duties of these priests were further regulated in the following manner. The *Hot'ri* had to perform the rites relating to the R'igveda, the *Adhwaryu* those based on the Yajurveda; the *Udgâtr'i* was concerned in the rites of the Sâmaveda; and the Brahman had to possess a knowledge of all these three Vedas, and to set right any mistake that might have occurred in the performance of the ritual acts, or remedy any defect which might vitiate the efficiency of the sacrifice. He was therefore the most learned of all the priests; and the R'igveda itself, though perhaps in one of its latest portions, recognizes the superiority of the priest Brahman. In the ritual works relating to the first three Vedas, no functions based on the use of the latest or the Atharvaveda are assigned to him, but in the *S'aunaka-Brâhman'a* of the *Atharvaveda*, where Prajâpati is introduced as intending to perform a soma sacrifice, and asking the Vedas whom he should choose for his Hot'ri, Adhwaryu, Udgâtr'i, and Brahman, the Vedas answer him: "Choose for a Hot'ri (the priest) who knows the R'igveda; for an Adwaryn, (the priest) who knows the Yajurveda; for an Udgâtr'i,(the priest) who knows the Sâmaveda; and for a Brahman (the priest) who knows the Atharvaveda;" and to explain the reason for such advice, they add that the R'igveda hymns having the earth for their abode, one who chooses a *Hotr'i* will obtain dominion over the earth; the Yajurveda mantras resting on the intermediate space, one who engages an *Adhwaryu* will obtain the world of that space; the Sâmaveda hymns dwelling on heaven, one who employs an *Udgâtr'i* will obtain that world; but one who chooses a *Brahman* will encompass the world of (the neuter) Brahman, or the supreme spirit, since the hymns of the Atharvaveda have for their abode Brahman.

The most interesting feature of this and similar passages is the tendency of their authors to maintain the greater efficiency of one of the later Vedas in comparison to that of the R'igveda, and consequently the greater practical superiority of these Vedas over the avowedly oldest Veda. And this is intelligible enough if we compare the contents of these Vedas.

The worship alluded to in many hymns of the R'igveda must have consisted more of isolated sacrificial offerings than of a series of acts strung together so as to form an elaborate sacrifice. There are other hymns, it is true, which betray the existence, at their time, of a ritual, already become complicated, as when three or four, or even seven, priests are mentioned by the poet; but though these hymns, as well as the former, bear testimony to the existence, at that early period, of ritual acts, it does not follow that the R'igveda, as such, was composed for the purpose of being recited when they were performed. From the nature of its hymns, it results, on the contrary, that, having been composed, they were at some subsequent period connected with those pious acts which became more and more complicated, and gradually were systematized. But then even there remain verses which would not easily bend to such artificial purposes; and whole hymns, too, which would resist an attempt to force them into a liturgic code for which they were not intended by the poet's mind. A collection of songs, in short, which was the natural growth of time, and, to some extent, at least, the ingenuous outburst of the poets' feelings, became inadequate for a regular liturgy of a highly-developed and throughout artificial ritual. Out of this necessity there arose the *Sâma-* and the *Yajurveda*. The former was entirely made up of extracts from the R'igveda, put together so as to suit the ritual of the so-called Soma sacrifices. For, as all native authorities agree in stating that the Sâmaveda contains none but R'igveda verses, the absence of 71 verses in the recension of this Veda, edited by prof. Benfey, from the recension in which the R'igveda now exists, does not disprove their unanimous statement: it must be accounted for by the circumstance that these verses belonged to one or the other of the recensions of the R'igveda, which, as mentioned before, are no longer preserved. The origin of the Yajurveda is similar to that of the Sâmaveda; it, too, is chiefly composed of verses taken from the R'igveda; but as the sphere of the ritual for which the compilation of this Veda became necessary is wider than that of the Sâmaveda, and as the poetry of the R'igveda no longer sufficed for certain sacrifices with which this ritual had been enlarged, new mantras were added to it—the so-called Yajus, in prose, which thus became a distinctive feature of this Veda; and it is on the Yajurveda, therefore, that the orthodox Hindu looked with especial predilection, for it could better satisfy his sacrificial wants than the Sâma-, and still more, of course, than the R'igveda. "The Yajurveda," says *Sâyan'a*, in his introduction to the Taittirîya Sanhitâ, "is like a wall, the two other Vedas like paintings (on it)." The sacredness of the Sâma- and Yajurveda, and the belief in their inspired character, rest on the assumption that they are of the same origin as the R'igveda, which dates from eternity, and which was "seen" by the R'ishis who uttered it. That, in the case of the Yajurveda, this theory is only partially correct, results already from the description just given of it; for whatever losses the present text of the R'igveda may have suffered, it is admitted by all authorities that its mantras were always metrical, and that it can never, therefore, have possessed passages in prose. But how frail this theory is, and in what sense it is possible to speak of the sameness of origin even in the case of those hymns of the Sâma- and Yajurveda which are composed of R'igveda verses, a comparison of the place occupied by the verses of a few hymns taken from one and the other of these Vedas with the place which the same verses occupy in the R'igveda, will sufficiently show.

The first hymn of the Sâmaveda consists of ten verses, nine of which are contained in the present recension of the R'igveda. If by the side of each of these verses the place is marked which it holds in the R'igveda, the result is this:

	Book.	Hymn.	Verse.
Sâmaveda 1, verse 1, is R'igveda	6	16	10
" " 2, "	6	16	1
" " 3, "	1	12	1
" " 4, "	6	16	34
" " 5, "	8	73	1
" " 6, "	8	60	1
" " 7, "	6	16	16
" " 8, "	8	11	7
" " 9, "	6	16	13

The verses of which the hymn of the Sâmaveda 1, verses 370–380, is composed, correspond with the following verses of the R'igveda:

	Book.	Hymn.	Verse.
Sâmaveda 1, verse 370, with R'igveda	8	86	10
" " 371, "	10	147	1
" " 372, "		absent	
" " 373, "	1	57	4
" " 374, "	3	51	1
" " 375, "	10	43	1
" " 376, "	1	51	1
" " 377, "	1	52	1
" " 378, "	6	70	1
" " 379, "	10	134	1
" " 380, "	1	101	1

If from the White Yajurveda the mantras, for instance, of the 22d to the 25th chapter were submitted to a similar test, it would be seen that in chapter 22, which has 34 divisions, only four verses occur in the R'igveda, viz.:

	Book.	Hymn.	Verse.
White Yajurveda 22, verse 10, in R'igveda	1	22	5
" " 15, "	5	14	1
" " 16, "	3	11	2
" " 18, "	9	110	3

that in chapter 23, with 65 divisions, there correspond:

	Book.	Hymn.	Verse.
White Yajurveda 23, verse 3, with R'igveda	10	121	3
" " 5, "	1	6	1
" " 6, "	1	6	2
" " 16, "	1	162	21
" " 32, "	4	39	6

that of chapter 24 being in prose, cannot occur in the R'igveda; and that of chapter 25, with 47 divisions:

	Book.	Hymn.	Verse.
White Yajurveda 25, verse 12, is R'igveda	10	121	4
" " 13, "	10	121	2
" " 14–23 are "	1	89	1–10
" " 24–45 "	1	162	1–22
" " 46 is "	10	157	1, 3, 2

(See the article "The Inspired Writings of Hinduism," in the *Westminster Review* for Jan., 1864.)

All, therefore, that is left of the oldest Veda in the Sâmaveda and Yajurveda, is a R'igveda piecemeal; its hymns scattered about; verses of the same hymn transposed; verses from different hymns combined, and even the compositions of different poets brought into one and the same hymn, as if they belonged to the same authorship. That, under such treatment, the Yajurveda should have lost all poetical worth, is but what may be expected; it must be, however, matter of surprise that the Sâmaveda should have saved so much, as it even now possesses, of that genuine beauty which distinguishes the R'igveda poetry. The *Atharvaveda*, too, is made up in a similar manner as the Yajurveda, with this difference only, that the additions in it to the garbled extracts from the R'igveda are more considerable than those in the Yajurveda. It is avowedly the latest Veda, and even its name, "Atharvaveda," as it was current already during the classical period of Sanskrit literature, does not yet occur in the oldest Upanishads (q.v.), where only the songs or revelations of the *Atharva-Angiras*, or of the *Bhr'igu-Angiras*, apparently denoting this Veda, are spoken of. The Atharvaveda was not used, as Madhusûdana, in his treatise on Sanskrit literature says, "for the sacrifice, but merely for appeasing evil influences, for insuring the success of sacrificial acts, for incantations, etc.;" but on this very ground, and perhaps on account of the mysteriousness which pervades its songs, it obtained, among certain schools, a degree of sanctity which even surpassed that of the older Vedas.

This being the general character of these four Vedas, a few remarks must here suffice to convey some idea of their special contents.

On the religious ideas expressed in the *R'igveda*, a general account is given in the article INDIA, sec. *Religion;* see also, besides the deities mentioned there, and the articles referring to them, VARUN'A, VÂYU, and YAMA, and J. Muir's "Contributions to a Knowledge of Vedic Theogony and Mythology," in the *Journal of the Royal Asiatic Society* for 1864. The social condition of the Hindus, as reflected from the hymns of this Veda, is not that of a pastoral or nomadic people, as is sometimes supposed, but, on the contrary, betrays an advanced stage of civilization. Frequent allusion is made in them to towns and cities, to mighty kings, and their prodigious wealth. Besides agriculture, they mention various useful arts which were practiced by the people, as the art of weaving, of melting precious metals, of fabricating cars, golden and iron mail, and golden ornaments. The employment of the needle and the use of musical instruments, are known to them. They also prove that the Hindus of that period were not only familiar with the ocean, but sometimes must have engaged in naval expeditions. They had some knowledge of medicine, and must have made some advance in astronomical computation, as mention is made of the adoption of an intercalary month, for the purpose of adjusting the solar and lunar years. Nor were they unacquainted with the vices of civilization, for we read in these hymns of common women, of secret births, of gamblers and thieves. There is also a curious hymn, from which it would follow that even the complicated law of inheritance, which is one of the peculiarities of the existing Hindu law, was to some extent already in use at one of the periods of the R'igveda hymns. The institution of caste, however, seems at that time to have been unknown, for there is no evidence to prove that the names which at a later period were current for the distinction of caste, were employed in the same sense by the poets of these hymns.—See Wil-

son's *R'igveda*, vol. i., re-edited by F. E. Hall, vols. ii., iii.; and vol. iv., edited by E. B. Cowell (Lond. 1850–66).

The only recension in which the Sanhitâ of the R'igveda has been preserved to us, is that of the *S'ákala* school; and the hymns themselves are arranged according to two methods, the one chiefly considering the material bulk, the other the authorship of the hymns. Both divisions, however, run parallel. According to the former, the whole Sanhitâ consists of eight *Asht'akas*, or eights; these, again, are divided into 64 *Adhyáyas*, or lessons; these into 2,006 *Vargas*, or sections; and the Vargas into *R'ichs*, or verses, the actual number of which is 10,417, but, according to the statement of native authorities, seems at some other time to have amounted to 10,616 or 10,622.—According to the other method, the Sanhitâ is divided into 10 *Man'd'alas*, or "circles;" the Man'd'alas into 85 *Anuvákas*, or "sections;" these into 1017, and 11 additional, i.e., into 1028 *Súhtas*, or "hymns," and the hymns into *R'ichs*, or verses, the number of which coincides, of course, with that of the former arrangement. The number of *padas*, or words, in this Sanhitâ is stated as being 153,826.

In eight out of the ten Man'd'alas, the first hymn or hymns are addressed to *Agni;* the next hymn or hymns generally to *Indra;* and after these come hymns to the *Vis'we Devás*—the deities collectively—or hymns to other special deities. The eighth Man'd'ala begins with hymns to Indra, and the ninth is chiefly devoted to Soma.

As for the authorship of the hymns, the second Man'd'ala belongs chiefly to that of *Gr'itsamada*, the third chiefly to that of *Vis'vámitra*, and the fourth chiefly to that of *Vámadeva*. The fifth was composed chiefly by *Atri*, and members of his family; the sixth by *Bharadvája* and members of his family; the seventh by *Vasisht'ha* and his kin; the first, eighth, ninth, and tenth by various R'ishis.—The text of the Sanhitâ has been edited in Roman characters by Prof. Th. Aufrecht (Berlin, 1861); and the text, with a commentary of Sâyan'a, is published by Prof. Max Müller, there having already appeared vols. i.–vi. of this edition (Lond., 1849–74). Of translations, the first volume of one by Max Müller appeared in 1869; that by the late Prof. H. H. Wilson, which was left by him completed in manuscript, follows the commentary of Sâyan'a, based on Hindu tradition; that begun by Prof. Benfey in the Journal *Orient und Occident*, vols. i. and ii. (Gött. 1862–64), is essentially speculative.

The Brâhman'a portion of the R'igveda is preserved in two works only—the *Aitareya Brâhman'a*, which consists of eight *Panchikás*, or "pentades," each of these comprising five *Adhyáyas*, or "lessons," and all the Adhyâyas together, 285 *Khan'd'as*, or "portions;" and the *S'ánkháyana*, or *Kaushítaki-Brâhman'a*, containing 30 *Adhyáyas*, also subdivided into a number of *Khan'd'as*. The following specimens, selected from the former, may illustrate the manner in which works of this category enjoin sacrificial rites and explain their secret meaning. The first relates to the ceremony of carrying the Soma (q.v.). "The king Soma lived among the Gandharvas. The gods and R'ishis deliberated as to how the king might be induced to return to them. *Vách*, the goddess of speech, said: "The Gandharvas lust after women. I (therefore) shall transform myself into a woman, and then you sell me to them (in exchange for Soma)." The gods answered: "No! how may we live without thee?" She said: "Sell me unto them; if you should want me, I shall return to you." Thus they did. In the disguise of a big naked woman, she was sold (by the gods to the Gandharvas) in exchange for Soma. In imitation (of this precedent), men drive away an immaculate cow of one year's age, this being the price at which they purchase the king Soma. This cow may, however, be rebought; for *Vách* returned to the gods. Hence the Mantras, after Soma has been bought, are to be repeated with a low voice. After Soma has been bought, the goddess of speech is with the Gandharvas; but she returns as soon as the ceremony of carrying the sacred fire is performed."

The following are the speculations of this Brahman'a on the *Yûpa*, or sacrifical post, and the meaning of the sacrificial animal:

"(The theologians) argue the question: Is the *Yúpa* to remain standing (before the fire); or is it to be thrown (into the fire)? (They answer:) For him who desires cattle, it may remain standing. (About this, the following legend is reported.) Once upon a time, cattle did not stand still to be taken by the gods for food. After having run away, the cattle stood still, and, turning toward the gods, said repeatedly: "You shall not obtain us. No, no!" Thereupon the gods saw that *Yúpa*-weapon which they erected. Thus they frightened the animals, which then returned to them. That is the reason that, up to this day, the sacrificial animals are turned toward the *Yúpa* (their head being bent toward the sacrificial post to which they are tied). Then they stood still to be taken by the gods for their food. . . . . The man who is initiated (into the sacrificial mysteries) offers himself to all deities. Agni represents all deities, and Soma represents all deities. When the sacrificer offers the animal to Agni and Soma, he releases himself from being offered to all deities. Some say: 'The animal to be offered to Agni and Soma must be of two colors, because it belongs to two deities.' But this precept should not be attended to. A fat animal is to be sacrificed, because animals (compared to the sacrificer) are fat, and he (compared to them) is lean. When the animal is fat, the sacrificer thrives through its marrow. Some say: 'Do not eat of the animal offered to Agni and Soma. Who eats of this animal, eats human flesh, because the sacrificer releases himself (from being sacrificed) by means of the animal.' But this precept, too, should

not be attended to. The animal offered to Agni and Soma was an offering to Indra, for Indra slew Vr'itra through Agni and Soma. Both then said to him: 'Thou hast slain Vr'itra through us; let us choose a boon from thee.' 'Choose yourselves,' answered he. But they choose this boon from him; and thus they receive (now as their food) the animal which is sacrificed the day previous to the Soma feast. This is their everlasting portion chosen by them; hence one ought to take pieces of it, and eat them."—See M. Haug's edition and translation of the *Aitareya Brâhman'a* (vol. ii. pp. 59, 78), vols. i., ii. (Bombay, 1863).

The principal object for which the *Sâmaveda* was compiled is the performance of those sacrifices of which the juice of the Soma plant is the chief ingredient; and of such sacrifices the most important is the *Jyotisht'oma*, which consists of seven stages: the Agnisht'oma, Atyagnisht'oma, Ukthya, Shod'as'in, Atirâtra, Aptoryâma, and Vâjapeya; but the performance of the Agnisht'oma alone was considered obligatory for those who wished to derive the chief advantage accruing from the celebration of this grand ceremony; while its other six stages, though adding to the merits of the sacrificer, were deemed voluntary. At the performance of such Soma sacrifices, the verses of the Sâmaveda were intoned; and there are special song-books which teach the proper manner how to chant them. The Sanhitâ of the Sâmaveda is preserved in two recensions: in that of the *Rân'âyanîya*, and probably also the *Kauthuma* school. It consists of two parts: the first, the *Chhandograntha*, also called *Archika*, or *Pûrvârchika*, contains, in the present recension, 585 verses, which are arranged into 59 *Das'ati* or decades, these being divided into *Prapât'hakas*, or chapters, and the latter, again, into *Ardhaprapât'hakas*, or half-chapters. The second portion, called *Staubhika*, or *Uttarágrantha*, or *Uttarârchika*, consists of 1225 verses, distributed over nine *Prapât'hakas*, which, too, are subdivided into *Ardhaprapât'hakas*. And there is this peculiarity in the Uttarâgrantha, that being for the most part arranged according to triplets of verses, the first verse of these triplets is frequently one which also occurs in the Archika portion. It is then called the *Yoni*, or parent verse, because the subsequent two, the *Uttará*, are symbolically its children, since they participate of all the modulations, stoppages, and other modifications which may occur in the chanting of the "parent" verse. These modulations, etc., are taught in the *Gânas*, or song-books mentioned before, two of which, the *Veyagâna* and *Aran'yagâna*, relate to the Archika; and two others, the *Uhagâna* and *Uhyagâna*, to the Staubhika part. The text of the Sâmaveda-Sanhitâ, in the Rân'âyaniya recension, has been edited and translated by Dr. J. Stevenson (Lond. 1842–43), and by Prof. Th. Benfey (Leip., 1848).

The number of *Brâhman'as* relating to this Veda is, by the native authorities, given as eight; and their names are: the *Praud'ha-*, or *Panchavins'a-*, the *Shad'vins'a-*, the *Sâmavidhi-*, or *Sâmavidhâna-*, the *Arsheya-*, the *Devatâdhyâya-*, the *Vans'a-*, the *Sanhitopanishad-Brâhman'a;* and the *Upanishad*, which probably is the *Chhândogya-Upanishad*, and thus is ranked among the Brâhman'as. A later Brâhman'a, probably of modern date, and which is not mentioned by Sâyan'a, is the *Adbhuta-Brâhman'a*. The latter and the *Van'sa Brâhmana* have been edited by Prof. A. Weber; the former in the *Indische Studien*, vol. iv. (Berlin, 1858); the latter in the *Abhandlungen der königlichen Akademie der Wissenschaften zu Berlin* (1858).

The history of the Yajurveda differs in so far from that of the other Vedas, as it is marked by a dissension between its own schools far more important than the differences which separated the schools of each other Veda. It is known by the distinction between a Yajurveda, called the *Black*, and another, called the *White Yajurveda*. Tradition, especially that of the Purân'as, records a legend to account for it. *Vais'ampâyana*, it says, the disciple of Vyâsa, who had received from him the Yajurveda, once having committed an offense, desired his disciples to assist him in the performing of some expiatory act. One of these, however, *Yâjnavalkya*, proposed that he should alone perform the whole rite; upon which, Vais'ampâyana, enraged at what he considered to be the arrogance of Yâjnavalkya, uttered a curse on him, the effect of which was that Yâjnavalkya disgorged all the Yajus texts he had learned from Vais'ampâyana. The other disciples, having meanwhile been transformed into partridges (*tittirî*), picked up these tainted texts, and retained them. Hence these texts are called *Taittirîyas*. But Yâjnavalkya, desirous of obtaining other Yajus texts, devoutly prayed to the sun, and had granted to him his wish—"to possess such texts as were not known to his teacher." And because the sun on that occasion appeared to Yâjnavalkya in the shape of a horse (*vâja*), those who studied these texts were called *Vâjins*. That part of this legend was invented merely to account for the name of the *Taittirîyas*, after whom a Sanhitâ and Brâhman'a of the Black Yajurveda, and for that of the *Vâjasaneyins*, after whom the Sanhitâ of the White Yajurveda is named, is clear enough. Nor is greater faith to be placed on it when it implies that the origin of this dissension ascended to the very oldest period of the Yajurveda; for there is strong reason to assume that the division took place even after the time of the grammarian Pân'ini (q.v.). See Goldstücker's *Pân'ini*, p. 139, ff. But so much in it is consistent with truth—that the Black Yajurveda is the older of the two; that the White Yajurveda contains texts which are not in the Black; and that, compared to the motley character of the former, it looks "white," or orderly. This motley character of the Black Yajurveda, however, arises from the circumstance, that the distinction between a Mantra and Brâhma'na portion is not so clearly established in

it as in the other Vedas; hymns and matter properly belonging to the Brâhman'as there being intermixed. This defect is remedied in the White Yajurveda; and it points, therefore, to a period when the material of the old Yajus was brought into a system consonant with prevalent theories, literary and ritual.

The contents of both divisions of the Yajurveda are similar in many respects. Two of the principal sacrifices of which they treat are the *Dars'apûrn'amâsa*, or the sacrifice to be performed at new and full moon, and the *As'wamedha*, or the horse-sacrifice, at the performance of which 609 animals of various descriptions, domestic and wild, were tied to 21 sacrificial posts. A *Purushamedha*, or man-sacrifice, unknown to the other Vedas, is also mentioned in it; its character, however, is symbolical.

The text of the Black Yajurveda is extant in the recension of two schools—that of *Apastamba*, to which the *Taittirîya Sanhitâ* belongs, and that of *Charaka*. The former, which is in course of publication—the first volume and part of the second having been already published, with the commentary of Mâdhavâchârya (Sâyan'a), by Dr. E. Roer and E. B. Cowell in the *Bibliotheca Indica* (Calcutta, 1860–64)—consists of seven *Kân'd'a*, or books, which comprise 44 *Prapât'haka*, or chapters, subdivided into 651 *Anuvâka*, or sections, and containing 2,198 *Kan'd'ikâs*, or portions.

The *Vâjasaneyi-Sanhitâ*, or the Sanhitâ of the White Yajurveda, exists in the recension of the *Mâdhyandina* and *Kân'va* school. In the former—the text of which, apparently also with the commentary of *Mahîdhara*, has been edited by Prof. A. Weber (Berlin, 1852)—this Sanhitâ has 40 *Adhyâyas*, or books, subdivided into 303 *Anuvâkas*, with 1975 *Kan'd'ikâs*.

The principal Brâhman'a of the Black Yajurveda is the *Taittirîya-Brâhman'a*, which, with the commentary of (Mâdhava) Sâyan'a, is in the course of publication by Baboo Rajendralâla Mitra—the first volume and part of the second having already appeared in print (Calcutta, 1860–65) in the *Bibliotheca Indica*. That of the White Yajurveda is the *S'atapatha-Brâhman'a*, the most complete and systematic of all Brâhman'as. Its text, with a semblance of the commentary of *Sâyan'a*, has been edited by Prof. A. Weber (Berlin, 1855).

The Atharvaveda has no circle of sacrifices assigned to it. Its object is, as observed before, to teach how to appease, to bless, to curse, etc. "The most prominent characteristic feature of this Veda," Prof. Whitney, one of its editors, remarks, "is the multitude of incantations which it contains; these are pronounced either by the person who is himself to be benefited, or, more often, by the sorcerer for him, and are directed to the procuring of the greatest variety of desirable ends. Most frequently, perhaps, long life, or recovery from grievous sickness, is the object sought; then a talisman, such as a necklace, is sometimes given, or, in very numerous cases, some plant endowed with marvelous virtues is to be the immediate external means of the cure; further, the attainment of wealth or power is aimed at, the downfall of enemies, increase in love or in play, the removal of petty pests, and so on, even down to the growth of hair on a bald pate."—*Journal of the American Oriental Society*, vol. iii. p. 308. It has been surmised (Müller's *Ancient Sanscrit Literature*, p. 447, ff.) that the hymns of the Atharvaveda "formed an additional part of the sacrifice from a very early time, and that they were chiefly intended to counteract the influence of any untoward event that might happen during the sacrifice." This is possible; but the great importance which the adherents of this Veda themselves attach to it, is founded on other considerations than these. They argue, as appears from the treatise *Atharvan'arahasya*, mentioned above, that the three other Vedas enable a man to fulfill the *dharma*, or religious law, but that the Atharva helps him to attain *moksha*, or eternal bliss. This doctrine is laid down, for instance, in the *Châlika Upanishad* of this Veda, when it says: "Those Brâhmans and others who know the science of the (neuter) Brâhman contained in the *Brahmaveda*, become merged in Brâhman; and it is likewise inferred from other passages in the *S'aunaka-Brâhman'a*. The name of *Brahmaveda* itself, by which this Veda is also frequently called, is, therefore, explained by them, not as implying the Veda which belongs to the province of the priest Brahman, but the Veda which contains the mysterious doctrine of Brahman, the supreme spirit, into which the human soul becomes finally absorbed. It is probable, therefore, that the very uselessness of the Atharvaveda for sacrificial purposes, and the reluctance which was felt to base its sanctity merely on its incantations and spells, invested it in the mind of its followers, with a spiritual character, which was then fully developed in the numerous Upanishads (q.v.) now connected with it.

The text of the Atharvaveda is preserved only in the *S'aunaka* school. Its Sanhitâ consists in the present edition of it, of 20 *Kân'd'as*, or books. Of these, the first 18 are subdivided into 34 *Prapât'hakas*, or chapters, with, altogether, 94 *Anuvâkas*, or sections, each containing a number of *mantras* (the 17th Kân'd'a consisting of a single Prapât'haka). The 19th Kân'd'a is not divided into Prapât'hakas, but into *Anuvâkas*, of which it contains seven; and the 20th likewise divided into *Anuvakas*, has nine, of which the third is subdivided into three *Paryâyas*.—The text of this Sanhitâ has been edited by Profs. R. Roth and W. D. Whitney (Berlin, 1856).

The only existing Brâhman'a of this Veda is the *S'aunhaka-* or *Gopatha-Brâhman'a*. "That this Brâhman'a," Prof. Müller observes, "was composed after the schism of the Charakas and Vâjasaneyins, and after the completion of the Vâjasaneyi-Sanhitâ, may be gathered from the fact, that where the first lines of the other Vedas are quoted in the

Gopatha, the first line of the Yajurveda is taken from the Vâjasaneyins, and not from the Taittiriyas."—*Ancient Sanscrit Lit.*, p. 452. Each of these Vedas received in time *Anukraman'îs*, or indices, which give the first word of each hymn, the number of verse's the names of the deities, the name and family of the poets, and the meter of every verse. The principal treatise of this kind is the *Sarvânukraman'î*, or "The General Index," ascribed to the authorship of *S'aunaka*. For the theosophical works which grew out of these Vedas, see the article UPANISHAD; and for the works which were composed in order to secure a correct reading and understanding of the Vedic texts, and a correct performing of sacrificial acts, see the article VEDÂNGA.—At a later period the name of Veda was also bestowed on *Itihâsas*—legends or legendary works—and *Purân'as* (q.v.), collectively; but in this sense it never obtained real currency. *Upavedas*, or minor Vedas, are also mentioned in the *Charan'avyûha* and other works, and explained by them in the following manner: The Upaveda of the R'igveda, they say, is the *Ayurveda*, or the Veda on medicine—probably the well-known works of Charaka and Sus'ruta; the Upaveda of the Yajurveda is the *Dhanurveda*, or the Veda on archery; the Upaveda of the Sâmaveda is the *Gândharvaveda*, on music; and the Upaveda of the Atharvaveda is the *S'ilpas'âstra*, a work on mechanical arts, or, according to others, the *Arthas'âstras*, works on practical subjects, comprising polity, mechanical science, the training of elephants and horses, and fencing.

In the preceding brief outline of the four Vedas, the question as to the date at which they were composed has not been raised, because, in the present condition of Vedic philology, an answer to it could only be hypothetical. From astronomical facts, based on a statement in a Vaidik calendar, Colebrooke concluded that this calendar was written in the 14th c. before the Christian era (*Miscell. Essays*, vol. i. pp. 109, 110); and though subsequent writers have questioned the full correctness of this conclusion, those most reliable nevertheless admit that the error, if any, could not lessen the antiquity of this calendar by more than 100 or 200 years. As this calendar must have been composed after the R'igveda had been arranged, and as such an arrangement itself must be posterior to the date of its last hymn, a full scope is left for imagination to fill up these intervals. But let it be understood that imagination alone would have to perform this task, since scientific research has as yet not yielded any means to check it, or prompt it on, as the case may be; nor is there any real prospect that future discoveries in Sanskrit literature will supply this want. A safer basis, however, may be looked for, if future research restricted itself to the question as to the *relative* age of these Vedic writings. Much valuable evidence has been already brought forward in this respect to prove that there are R'ishis ancient, and less ancient (see, for instance, J. Muir's *Original Sanskrit Texts*, vol. ii. p. 205, ff.); that there are R'igveda hymns older than others (for instance, in Müller's *Ancient Sanskrit Literature*); but, on the other hand, much confusion has also been produced by starting a theory that all the Brâhman'as belong to one period, and all the hymns to another period preceding it, of which, again, two stages were thought to be discernible, and by assigning dates to the Brâhman'a period, as well as to each of the two stages of the Mantra period. For, apart from the purely imaginary value of such dates, and apart from the circumstance that no evidence whatever has as yet been brought forward to justify an assumption of only two stages of hymns, each of which would comprise only 200 years, it is clear that the similarity of subject-matter alone—such as it marks the literary character of the Brâhman'as—cannot be a criterion for determining that *all* the Brâhman'as must be more recent than *all* the Sanhitâs. That a Brâhman'a of the R'igveda must be posterior to those hymns of the R'igveda Sanhitâ which it mentions, but to those alone—again, that a Brâhman'a of the Sâmaveda must be younger than the hymns of the Sâmaveda on which it relies, and so on—cannot be matter of doubt; but as the Sanhitâ of the Sâmaveda, for instance, must be more recent than that of the R'igveda, and as no fact whatever has been adduced to show why the Aitareya Brâhman'a, or other Brâhman'as of the R'igveda, could not have appeared before a Sâmaveda-Sanhitâ was made, and so forth in the case of the other Vedas, it follows that it would be entirely unsafe to infer that all the Brâhman'as must be more recent than all the Sanhitâs; nay, even that all the Brâhman'as must be later than *all* the hymns of the R'igveda, since not all of them need have existed before the oldest Brâhman'a of this Veda was composed. A result like this is, unhappily, purely negative, but it may have the advantage of counseling caution and stimulating research.

VEDANGA—from Veda (q.v.) and *anga*, limb; hence, literally, "the limb of (the body of) the Veda"—is the name of six Sanskrit works, the object of which is to teach how to read and understand correctly the Vedic texts, and how to apply them correctly to sacrificial purposes. Whether the number of these works was originally the same as it now is, and already was at the time of the Upanishads, may be doubtful. Tradition mentions the following Vedângas: 1 *S'ikshâ*, or the science of proper pronunciation. It is represented by a short treatise of 35, or, in another recension, of 59 verses, which explains the nature of letters, accent, and pronunciation, and is ascribed to *Pân'ini* (q.v.). 2. *Chhandas*, or (a work on) meter, which is ascribed to *Pingala*. 3. *Vyâkaran'a*, or grammar, by which native authorities understand the celebrated work of *Pân'ini* (q.v.); but never those short books, especially concerned in Vedic peculiarities, called *Prâtis'âkhyas*, the existing representatives of which, in all probability, are posterior to Pân'ini (see Gold-

stücker's *Pân'ini*, etc., p. 183, ff.). 4. *Nirukta* (q.v.) 5. *Jyotisha*, or astronomy. "Its chief object is to convey such knowledge of the heavenly bodies as is necessary for fixing the days and hours of the Vedic sacrifices." 6. *Kalpa*, or works on the Vedic ceremonial, which systematize the ritual taught by the Brâhman'a portion of the Veda, omitting, however, all legendary or mystical detail. They are composed in the Sûtra style. See SÛTRA. The Kalpa, or Sranta, Sûtras belonging to the R'igveda are the *As'valâyana-*, *Sânkhâyana*, and *S'aunaka Sûtras;* those relating to the Sâmaveda, the *Mas'aka-*, *Lâtyâyana-*, and *Drâhyâyan'a* Sûtras; those of the Black Yajuveda, the *Apastamba-*, *Baudhâyana-*, *Satyâshâd'ha-*, *Hiran'yakes'in-*, *Mânava-*, *Bhâradvâja-*, *Vâdhûna-*, *Vaikhânasa-*, *Laugâkshi-*, *Maitra-*, *Kat'ha-*, and *Vârâha* Sûtras. The White Yajurveda has only one Kalpa, or 'Sranta, Sûtra connected with it, the *Kâtyâyana* Sûtra, and the Atharveda likewise only one, the *Kus'ika Sûtra.*—At a later period these works were supplemented by a similar class of works, which, however, merely describe the domestic ceremonies, viz., "the marriage rite, the rites to be performed at the conception of a child, at various periods before his birth, at the time of his birth, the ceremony of naming the child, of carrying him out to see the sun, of feeding him, of cutting his hair, and lastly, of investing him as a student, and handing him to a guru, under whose care he is to study the sacred writings." Works of this kind are called *Gr'ihya-Sûtras* (from *gr'iha*, house), and to these, again, were added the *Sâmayâchârika-Sûtras* (from *samayâchâra*, conventional practice), which treat of customs sanctioned by the practice of pious men, but not enjoined or expressly stated in the Gr'ihya-Sûtras. The two last classes of Sûtras, which are not comprised amongst the Kalpa works, then grew into the *Dharmas'âstras*, or law-books, of which that of *Manu* is the chief representative. See Müller's *Ancient Sanskrit Literature*, p. 108, ff.

VEDÂNTA (from the Sanskrit *veda* and *anta*, end; hence, literally, "the end or ultimate aim of the Vedas") is the second great division of the *Mîmânsâ* (q.v.) school of Hindu philosophy. It is chiefly concerned in the investigation of *Brahman* (neuter), or the Supreme Spirit, and the relation in which the universe, and especially the human soul, stands to it; and in contradistinction from the *Pûrvamîmânsa*, or the investigation (*mîmânsâ*) of the former (*pûrva*) part of the Vedas—viz., the Sanhitâ, and especially the *Brâhman'as* (see VEDA)—which contain the *dharma*, or religious law (see MÎMÂNSÂ), it is also called *Uttara-mîmânsâ*, or the investigation (*mîmânsâ*) of the latter (*uttara*) part of the Vedas—viz., *Aran'yakas* and *Upanishads* (q.v.), which treat of (the neuter) *Brahman*, or the Supreme Spirit [not to be confounded with (the masculine) *Brahman*, or the god of the mythological *Trimûrti* (q.v.)]. Sometimes the name given to it is *S'ârîraka-mîmânsâ*, or the investigation of the soul (s'ârîaka). In its method, the Vedânta differs from the Nyâya (see NYÂYA and VAIS'ESHIKA) by endeavoring to explain the universe as a successive development from one ultimate source or principle—whereas the Nyâya, in both its divisions, treats of the objects of human knowledge of which the universe is composed, under different topics, unconcerned about their mutual relation of effect and cause; and from the *Sânkhya* (see SÂNKHYA and YOGA), it is distinct, inasmuch as that system is based on the assumption of a duality of principles whence the universe derives its origin.

The object-matter of the Vedânta is the proof that the universe emanates in a successive development from a Supreme Spirit or soul, which is called *Brahman*, or *paramâtman;* that the human soul is therefore identical in origin with Brahman; that the worldly existence of the human soul is merely the result of its ignorance of this sameness between itself and the Supreme Spirit; and that its final liberation or freedom from transmigration (q.v.) is attained by a removal of this ignorance, that is, by a proper understanding of the truth of the Vedânta doctrine.

According to this doctrine, *Brahman* (neuter) is both the efficient and material cause of the world, creator and creation, doer and deed. It is one, self-existent, supreme, as truth, wisdom, intelligence, and happiness; devoid of the three qualities, in the sense in which created beings possess them; and at the consummation of all things, the whole universe is resolved or absorbed into it. From Brahman individual souls emanate, as innumerable sparks issue from a blazing fire. The soul, therefore, is neither born, nor does it die; it is of divine substance, and as such, infinite, immortal, intelligent, sentient, true. Its separate existence, as distinct from Brahman, is the cause of its ignorance; and this ignorance, which consists in regarding the world as a reality capable of subsisting without Brahman, has a double power—that of enveloping and projecting. By means of the former it makes the soul liable to mundane vicissitudes, as to the sensations of pleasure, pain, etc. The projective power of ignorance, when encompassing the soul in its fourth condition, or that of pure intellect (its other conditions are: waking, dreaming, and dreamless sleep) produces out of the darkness which then prevails the five subtile elements—viz., *ether*, which is the substratum of the quality sound; *air*, which arises from ether, the substratum of touch; from air, *fire or light*, the substratum of color; from light, *water*, the substratum of savor; and from water, *earth*, the substratum of smell. From these subtile elements are then produced 17 subtile bodies and the five gross elements. The former, also called *lingas'arîra*, because they are bodies (*s'arîra*) which impart to existing beings their individual character (*linga*), are *the five organs of perception*—viz., the organs of hearing, touch, sight, taste, and smell, which arise sev-

erally from the *pure* or inactive particles of each of the subtile elements; further, *two intellectual organs*, which are produced from the *mingled pure*, or inactive particles of the subtile elements—viz., *buddhi*, understanding, the function of which is to arrive at a certainty or conclusion, and *manas* (an organ of volition and imagination), the function of which consists in willing and doubting—thinking and referring the external objects to one's own self, being two functions common to both of them; lastly, *the five organs of action*—viz., the voice, the hands, the feet, the organ of excretion and that of generation, which are severally produced from the *foul* or *active* particles of each of the subtile elements; and *the five vital airs*, which are produced from the *mingled foul* or *active* particles of the subtile elements—viz., the air breathed forth, which has its place in the fore-part of the nose; the air breathed downward, which has its place in the lower intestines; the air which circulates through the whole body; the ascending air, which has its place in the throat, and the descending air in the middle of the body, which causes assimilation and digestion of food, produces semen, excrements, etc. (Later Vedântists assume ten such vital airs—viz., besides the foregoing, the airs which severally cause retching, winking, hunger, yawning, and fattening.) The five *gross elements* are the five subtile elements, when, according to a theory derived from a scriptural text, they have become so divided and combined that each of them retains a preponderating portion of itself, and consequently of the quality of which it is the substratum—as ether of sound, etc.—and besides smaller portions of the other subtile elements, and the qualities of which they are the substrata. From these gross elements then arise the various (mythological) worlds, and this world, too, with bodies which are distinguished as viviparous, or those produced from a womb, as men, beasts, etc.; oviparous, or those produced from an egg, as birds, snakes, etc.; those generated by "sweat" or hot moisture, as lice, gnats, etc.; and those germinating, as creepers, trees, etc. The soul, when existing in the body, is encased in a succession of "sheaths." The first or interior "sheath" consists of *buddhi*, associated with the organs of perception; the second, of *manas*, associated with the organs of action; and the third, of the vital airs together with the organs of action. These three "sheaths" constitute the subtile body of the soul, which attends the soul in its transmigrations; and the collective totality of such subtile bodies is the supreme soul, as regarded in its relation to the world; when it is also called "the soul which is the thread," or passes like the thread through the universe, or hiran'yagarbha, or life. The fourth and exterior "sheath" of the soul is composed of the gross elements; and the collective aggregate of such gross bodies is the gross body of the deity. This whole development being the result of ignorance, the soul frees itself from its error by understanding that the different stages in which this development appears, do not represent real or absolute truth; and when its error has completely vanished it ceases to be re-born, and becomes reunited with Brahman, whence it emanated. But since the means of arriving at a final deliverance can only be the complete mastery of the truths of the Vedânta, other means, such as the performance of sacrifices or other religious acts enjoined by the Vedas (q.v.), or the practice of Yoga (q.v.), cannot lead to the same result. They may be meritorious, and are even recommended as such, but can effect only an apparent liberation. Of this there are two kinds: one liberation which is effected in lifetime, and enables a man to perform supernatural actions or wonders, as the evocation of the shades of progenitors, going anywhere at will, and similar feats; and another which takes place after death, and enables the soul, not divested of its subtile body, to reside in heaven; but after a time its effect ceases, and the soul has to renew its mundane existence. In order to fit the mind for meditating on these truths, various moral duties are enjoined, and various practices are recommended, especially by later Vedânta writers. Thus, the student of the Vedânta is told not to hurt a sentient being, to speak the truth, not to steal, to practice continence, and not to accept gifts; to remain pure and content, to do penance, and to study the Vedas; also to remain in certain postures, to practice various modes of suppressing his breath, and the like. These injunctions, however, are extraneous to the doctrine itself, and appear to be a compromise with the old orthodox faith, which requires the peformance of religious acts, and a later stage of it, which favors such austere practices as are especially known by the name of Yoga (q.v.). Tho doctrine of *bhakti*, or faith, does not belong to the older Vedânta; it is, however, an interesting feature of the later periods of this philosophy; and the same observation applies to the doctrine of *Máyá*, or illusion, according to which the world has no reality whatever, but is merely the product of imagination; for the older Vedânta, as will have been seen, merely teaches that the world is not *the truth*, but does not deny its material reality.

The oldest work on this philosophy is attributed to *Bâdaráyan'a*, or *Vyâsa* (q.v.), and is written in the Sûtra (q.v.) style; it is called the *Brahma-Sûtra;* it consists of four *adhyâyas*, or lectures, each subdivided into four *pâdas*, or chapters; each pâda containing a number of Sûtras. The number of the latter is 558, and that of the *adhikaran'as* or topics treated in them, 191. The most important commentary on this work is the *S'ârîrakamîmânsâ-bhâshya*, by *S'ankarâchârya* (q.v.); and this commentary, again, has been commented on by a great variety of writers. The text of the Sûtras and this commentary have been edited at Calc., 1818; and the text with this commentary, and a gloss on the latter, by Govindânanda, in the *Bibliotheca Indica*, by Pandita Râma Nârâyan'a Vidyâratna, Calc., 1863. Of the great number of other commentaries on the

Brahma-Sûtras, mention may be made only of that by *Râmânuja* (q.v., under VAISHNAVAS), and of a short but very lucid one, by *Anûpanârâyan'as'iroman'ibhat't'a* (edited at Calc., without date). Among elementary treatises on the Vedânta, the most popular is the *Vedântasâra*, by *Sadânanda*, which, with the commentary of *Râmakr'ishn'a Tîrtha*, has been edited at Calc., 1829, and with this and another commentary by *Nr'isinhasaraswatî*, at Calc., 1849. It has been edited and translated also by the late Dr. J. R. Ballantyne (*A Lecture on the Vedânta, embracing the Text of the Vedânta Sâra*, Allahabad, 1850), who also translated the beginning of the Brahma-Sûtras.—A very useful compendium of the *Adhikaran'as*, or topics, is the *Adhikaran'amâlâ*, by *Bhâratîtîrtha*, which, with the commentaryof *S'rî Anandachandra-Vedântavâgîs'a*, has been edited, Calc., 1862, and as an appendix to the Brahma-Sûtras, with extracts from this commentary, in the *Bibliotheca Indica*, 1863.

VEDDER, ELIHU, painter; b. in New York, Feb. 26, 1836; studied with Picot in Paris; and after 1856 lived almost continuously in Rome, Italy. He was elected a national academician 1865, and member of the society of American artists 1880, and was honorably mentioned at the Paris exposition 1889. His paintings include "The Lair of the Sea Serpent;" "The Arab Listening to the Sphinx;" "Young Marsyas;" "Cumœan Sibyl;" and a series of mural paintings in the new congressional library at Washington. His illustrations of the Rubaiyat of Omar Khayyám attracted much attention.

VEDETTES are mounted sentinels, placed about 100 yards in advance of the outposts of an army, to watch the enemy and signal the approach of danger.

VEER, in sailing, is to pass from one board to the other by bringing the stern to windward. It is therefore the same action as *gybing* (q.v.).

VEGA, GARCILASO DE LA. See GARCILASO DE LA VEGA.

VEGA-CARPIO, LOPE FELIX DE, a celebrated Spanish poet, was born at Madrid on the 25th November, 1562. From his very infancy, he is said to have given promise of extraordinary talent. Like Pope, he "lisped in numbers." On the death of his father, the family, originally a good one, fell into great difficulties, and was broken up. The young Lope fell to the charge of his uncle, the inquisitor, Miguel del Carpio, who spared no pains to give him a good education. He was sent to the imperial college at Madrid, and seemed to be progressing quietly toward the holy state, to which, by his uncle, he was destined, when an odd whim struck the lad, and, being then fourteen, he went off on a roving expetition with a comrade. But he and his companion were speedily arrested as thieves on their trying to effect the sale of a chain of gold (probably stolen from Lope's uncle), and sent back to Madrid. The returning prodigal was but coolly received by his reverend relative, who declined to further concern himself with a nephew of such distinctly *lay* propensities. He in consequence became a soldier; and in 1577 served at Terceira against the Portuguese. After this we find him taken in hand by Geronimo Manrique, bishop of Avila, who sent him to finish his studies at the university of Alcala. Here he was again ripening for holy orders, and was nearly in fact ripe, when again the passion of the vagabond drove him out upon the world a pervert. For some time, at this period of his life, Lope disappears from public view; and probably his adventures were of the kind which a discreet biographer will always permit his hero to prosecute as far as possible in private. It is understood that in his dramatic romance, *Dorothea*, he afterward favored the world with a sketch of himself and of these his early experiences; and if this is in detail to be taken as history, Lope, on his own shewing, must have been no more a model of propriety than certain other great poets who might be named. Toward 1585 we find him again at Madrid, attached to the person of a young duke of Alva, for whom he composed the piece entitled *Arcadia*, a tedious pastoral, with verses interspersed, which only in detached passages displays his brilliant ability. About this time he married a lady of condition, by the name of Isabella de Urbino; but his domestic felicity was speedily cut short by a misadventure. Having had some difference with a gentleman of court, he satirized him in a filthy ballad; and on finding that he took it amiss, gave him satisfaction by running him through the body. For this he was thrown into prison, and afterward exiled to Valencia. He returned to Madrid as soon as he could with safety, and soon after lost his wife, whom he is said to have tenderly loved. Grief for her death, complicated with want of success in another of his little love-affairs, drove him to join the famous *Armada*, then being fitted out for the conquest of England. Through the perils of this disastrous expedition Lope came with a whole skin, and in 1590 was again safe in Madrid. A brother to whom he was much attached, and who sailed as an officer in the same vessel, had not the same luck, but died during the voyage. It is a characteristic trait, that Lope—who, whatever else he may be doing, must always be conceived as flooding out continuous torrents of verse—composed, amid the distractions of tempest and battle, a long poem, the *Hermosura de Angelica*, which, as a continuation of the *Orlando Furioso* of Ariosto, has found favor even with express admirers of that poet. Shortly after his return he became secretary to the marquis of Malpica and subsequently to the count of Lemos, whose service he quitted soon after his marriage, in 1597 to Donna Juana de Guardio, resolving thenceforward to trust solely to literature for his livelihood. This he could well do with every confidence, as already one of the most admired authors of the day, and by far the most popular dramatist. The years immediately succeeding, he himself frequently afterward refers to as the hap-

piest period of his life; but it was not of very long duration. At the age of seven, his son Carlos died; and soon after, in giving birth to a daughter, his wife also died. The double blow was severe. A mistress, indeed, remained to console him, Donna Maria de Luxan, by whom he had a boy and girl, the latter of whom, Marcela, was the most beloved of all his children. But he had no doubt got a little tired of Donna Maria; and about this time he began to turn his thoughts seriously to religion. Having had as much vice as he cared for, he considered he had reached the point in his career at which piety might begin to be prosecuted with advantage. Accordingly, after an interval of devout preparation, he became, in 1609, a priest of the order of St. Francis. Of his zeal in his new functions, there is evidence in the fact, that in Jan. 1623, he took prominent part in the ceremony of burning a heretical brother of his order. As to his performance of priestly duty otherwise, strictly thus much is known, that, with his old unremitting assiduity, he continued to pour forth poems and dramas, not always of a clerical or decent kind. During his last years, he fell into a profound religious melancholy. Despite the decay of his strength, he was rigorous in keeping himself up to the severest mark of discipline; in particular, he scourged himself terribly. Finally, in the beginning of Aug. 1635, he gave himself a scourging so terrible, that the walls of the chamber were found bespattered with his blood ; and some days after he died of it. Lope was the idol of his contemporaries ; his very name became a synonym of excellence, and his fame was almost as remarkable outside of Spain. His dramas, on which his popularity mainly rested, number not less than 1800. The ease and grace of his versification are unsurpassed, but in deep and serious qualities he is deficient.

VEGETABLE CHEMISTRY is the chemistry of plants. On submitting to incineration a plant which has been dried at a moderate heat till it ceases to lose weight, we find that the residue, which consists of mineral salts and a little carbon, is much lighter than the original plant, the portion which is burned off, or apparently lost, corresponding to the organic constituents of the plant. Hence every plant, like every animal, is composed of *organic* and *mineral* or *inorganic constituents*. While the mineral constituents of the plant are also found in the crust of the earth, the organic constituents are primarily formed in the plant itself from inorganic matters, viz., from *water*, *atmospheric air*, and the *soil*, which collectively may be termed the food of plants.

(1.) All organic constituents of plants contain *carbon*. (2.) All such organic constituents contain *hydrogen*. Some, as, for example, many ethereal or volatile oils, consist solely of these two elements. (3.) The greater proportion of these compounds contain *oxygen* in addition to the two preceding elements. To this class belong those constituents of plants which are at the same time of the most general diffusion and of the greatest physiological and economic importance; namely, the so-called *carbo-hydrates*, which consist of carbon combined with hydrogen and oxygen in the exact proportion in which the last two elements form water. Under this title are included cellulose, starch, gum, etc. Other organic constituents contain not only carbon with hydrogen and oxygen in the above ratio, but an excess of hydrogen. In this category may be placed almost all the *organic acids*, many *ethereal oils*, *wax*, the *resins*, many of the so-called *glycosides*, and the *fats*. (4.) With the above elements, *nitrogen* is associated, to form two very important groups of constituents, viz., the *organic bases* or *alkaloids*, and the *albuminates* or *proteine bodies*. Although the nitrogenous groups never form more than a small part of the mass of a plant, nitrogen is never altogether absent from a plant. (5.) In association with all the above-named elements, *sulphur* in small quantity is present in the albuminates of all plants; in association only with carbon and hydrogen, it occurs in oil of garlic and oil of asafetida; and when combined with carbon, hydrogen, and nitrogen, it has been as yet only found in oil of mustard. Whether *phosphorus* in very minute quantity occurs in any of the vegetable albuminates, is still uncertain.

The inorganic constituents which are found in the ashes of all plants are: *potash*, *soda*, *magnesia*, and *lime*, in combination with *phosphoric*, *sulphuric*, *hydrochloric*, and *carbonic acids*, and additionally, *iron*, *manganese*, and *silica*, with traces of *fluorine;* while the marine plants or sea-weeds contain also appreciable quantities of *bromine* and *iodine*. *Alumina* and *baryta* are also occasionally found, as also are *nitrates* in certain plants. The carbonates almost always found in the ash are, as is well known, for the most part formed by the action of the incineration upon the salts of the vegetable acids, such as the acetates, citrates, etc., and probably in some other respects, the arrangements of the constituents of the ash are not precisely identical with those of the mineral ingredients while existing in the actual plant. Among the most essential of the inorganic constituents is *water*, which acts as a solvent for the matters dissolved in the vegetable juices, and forms a very preponderating part of the mass, sometimes amounting to from 86 to 96 per cent. of the whole plant. From the preceding remarks, it is obvious that the nutrition and development of plants is dependent on their absorbing *carbon-compounds*, *hydrogen-compounds*, *nitrogen-compounds*, *sulphur-compounds*, *water*, and such *inorganic compounds* as yield the necessary inorganic constituents in a form capable of assimilation; together with the presence of *oxygen*, which is required for the formation of organic oxygenous compounds.

The assimilation of *carbon* first claims our attention. The composition of the atmospheric air, from whatever part of the earth's surface it is taken, is, as is well known, constant, in so far as the relative volumes of oxygen and nitrogen are concerned; while

the variations in the carbonic acid, except when there are obvious causes for an excess (as, for example, an over-crowded room), are very slight, and, as a general rule, deviate scarcely at all from 4 volumes in 10,000 of air. Yet causes disturbing this uniformity are perpetually at work. Prof. Mulder, adopting Lavoisier's and Davy's experiments, according to which a man consumes about 26 cubic ft. of oxygen in 24 hours (and later observers place the daily quantity at 45 cubic ft.), calculated his yearly consumption at more than 9,500 feet. Considering the enormous numbers of men and animals on the surface of the globe, and the lamps, fires, furnaces, etc., ever burning, the atmosphere would apparently soon cease to be fit for the support of life (1) in consequence of the great diminution of oxygen, a gas essential to life, and (2) in consequence of the great excess of carbonic acid, a gas deleterious to life. The cause of this marvelous uniformity of atmospheric air under these circumstances is that function of plants by which they absorb their carbon. It is to the experiments and observations of Priestley in 1771, Ingenhousz in 1776, Senebier in 1807, and many later observers, that we are indebted for the knowledge of the great general fact, that plants take up the carbonic acid from the air, reduce it in their organism, and retain the carbon for the composition of their own organisms, while they restore the oxygen gas to the atmosphere. It is chiefly by the leaves, which may be regarded as the respiratory organs, that this process is carried on. It is needless here to notice the questions as to whether it is only during light, or constantly, that these changes go on; whether different rays of the spectrum act with more or less power in liberating the oxygen, etc. Independently of the proof afforded, for example, by placing green plants in a mixture of 70 parts of common air and 30 parts of carbonic acid, and finding that, in the course of four hours, the carbonic acid has been almost entirely replaced by oxygen, we have obvious evidence in the case of lichens growing on a naked rock, that the carbon which they contain must be obtained from the atmosphere. In the case of aquatic plants, the process is identical, the atmospheric air being dissolved in the water. Carbon, in some form of combination or other, probably forms about two-thirds of the weight of a dried plant. The assimilation of *hydrogen* from the decomposition of water in and by the plant, is not capable of the same direct proof as that of carbon; but there are strong grounds for believing in its occurrence. This view is supported by the composition of wax, the resins, volatile oils, etc., and indeed it is difficult to see from what other source the hydrogen could be derived. In that case, the water, like the carbonic acid, contributes its oxygen to the air. The *nitrogen*, which enters into certain constituents of plants, is derived from ammonia, and not, as might have been supposed, directly from the air, of the volume of which it forms about four-fifths. It has been shown by the direct observations of Boussingault, that plants cannot assimilate nitrogen, that those which have been made to absorb it by placing their roots in nitrogenous water, throw it off unchanged, and that vegetation cannot exist in a soil which contains no substances readily convertible into ammonia. The indifference of nitrogen to other elements, and the extreme readiness with which ammonia becomes decomposed, and enters into different combinations (the amides, imides, amido-acids, compound ammonias, and probably also the albuminates, being derivatives of it), together with the conclusion we draw from the action of liquids containing ammonia, or matter convertible into it, as gas-liquid, fluid sewage, etc., confirm this view. The ammonia taken up by plants is obtained partly from the air, and partly from the soil. In the air it is formed after thunderstorms, and it is further supplied to the atmosphere by putrefactive processes, animal excretions, and volcanic action. It is indeed found in snow and in all rain-water, and is thus conveyed to the soil. Although direct experiments show that the air contained in the pores of the soil is richer in ammonia than ordinary atmospheric air, it is easy to show that a plant can derive its ammonia from the latter alone, by a reference to the vegetation on naked rocks, or by growing plants in powdered charcoal duly moistened with rain-water. Hence both air and soil contribute the ammonia from which the nitrogen is fixed in the plant. The *oxygen* which occurs in the various constituents of the plant is derived from the decomposed carbonic acid and water, and corresponds to the difference between the amount contained in those absorbed compounds and the amount liberated to the atmosphere. The *sulphur* that occurs in the albuminates and certain ethereal oils must be derived from the soil, since it does not occur either free or in combination in the air; and as the only form in which it is found in common soil is as sulphates, plants must have the property of decomposing these salts, and appropriating their sulphur after reduction. Extensive experience has proved that certain *inorganic constituents* are as indispensable to the life and development of the plant as the organic elements we have been considering; and further, that special plants require special inorganic constituents, as is shown in works on agricultural chemistry. The two following facts seem well established: (1) that the roots of plants exert a special selective power, and absorb some salts, and reject others that are also in solution in the water of the soil; and (2) that the top or vegetable soil has the power of absorbing and retaining the most necessary mineral ingredients, and does not allow them to be carried deep into the ground by the rain; but for the discussion of this subject we can only refer to the experimental researches of Liebig, Mulder, Huxtable, Way, etc. It would be altogether out of place to enter into the consideration of the prodigious synthetic and analytic power of the vegetable cells; we shall merely indicate how some of the most important

vegetable compounds are probably formed; beginning with the *vegetable acids*. "Even," says Prof. Gregory, "when carbonic acid and water are brought together in the cell, this is not enough. There must be present, first, albuminous matter, without which no active cell can exist; secondly, mineral matter, especially alkalies, phosphates, and salts. All these conditions being fulfilled, and light being admitted, we may suppose the first organic acid formed to be oxalic acid, the least complex of all."—*Organic Chemistry*, 4th ed. p. 541. Putting it in the briefest terms, the cell separates 1 atom of oxygen from 2 molecules of carbonic acid, and in presence of water yields 1 molecule of *oxalic acid*, or $2CO_2 - O + H_2O = H_2C_2O_4$. Two equivalents of dry oxalic acid, $2H_2C_2O_4$, by taking up 1 molecule of water, and losing 4 atoms of oxygen, yield *malic acid*, $C_4H_6O_5$. *Tartaric* and *citric acids* are capable of a similar production. Thus, 2 equivalents of dry oxalic acid, combining with 1 of water, and losing 3 atoms of oxygen, yield tartaric acid, $C_4H_6O_6$; and similarly, 3 equivalents of dry oxalic acid, combining with 1 of water, and losing 6 atoms of oxygen, yield citric acid, $C_6H_8O_7$. In like manner every vegetable acid, and every one of the neutral compounds of carbon, hydrogen, and oxygen, may be derived from some less complex compound, containing more hydrogen than itself; or, it may be supposed to be derived directly from carbonic acid and water, oxygen being, on every supposition, given off. "As the proportion of oxygen to carbon diminishes, the acids become weaker, till the oxygen exactly suffices to form water with the hydrogen, when we have either very feeble acids, or neutral bodies, such as sugar, gum, and starch. As the oxygen is still further diminished, we have neutral, bitter, and acrid compounds, or colored bodies, or such as yield coloring matters, with ammonia and oxygen; further on still we have aromatic oils, and volatile, quasi-resinous, crystallizable acids; then resins; and lastly, when all the oxygen is expelled, certain oils, which are carbo-hydrogens."—Gregory, *op. cit.*, p. 543. Although each individual substance is doubtless in reality derived from some substance only a little less complicated than itself, the final result, in so far as showing their mode of construction is concerned, is the same as if they were all obtained directly from carbonic acid and water. The following tabular view (compiled by Gregory) will serve to show how all the leading groups of vegetable compounds are produced from carbonic acid and water by deoxidation. Gregory's formulæ are here altered so as to conform to the new system of chemical nomenclature:

SUBSTANCES FORMED. Name.	Formula.	=	Carbonic acid.	+	Water.	—	Oxygen.
1. *Vegetable Acids*—							
Tartaric acid	$C_4H_6O_6$	=	$4CO_2$	+	$3H_2O$	—	5O
Malic acid	$C_4H_6O_5$	=	$4CO_2$	+	$3H_2O$	—	6O
Citric acid	$C_6H_8O_7$	=	$6CO_2$	+	$4H_2O$	—	9O
2. *Carbo-hydrates*—							
Cellulose	$C_6H_{10}O_5$	=	$6CO_2$	+	$5H_2O$	—	12O
Starch	$C_6H_{10}O_5$	=	$6CO_2$	+	$5H_2O$	—	12O
Cane-sugar	$C_{12}H_{22}O_{11}$	=	$12CO_2$	+	$11H_2O$	—	24O
3. *Other Neutral Bodies**—							
Mannite	$C_6H_{14}O_6$	=	$6CO_2$	+	$7H_2O$	—	13O
Salicine	$C_{13}H_{18}O_7$	=	$13CO_2$	+	$9H_2O$	—	28O
Pectine	$C_{28}H_{42}O_{24}$	=	$28CO_2$	+	$21H_2O$	—	53O
Hematoxyline	$C_{16}H_{14}O_6$	=	$16CO_2$	+	$7H_2O$	—	33O
Elaterine	$C_{30}H_{25}O_9$	=	$30CO_2$	+	$12\frac{1}{2}H_2O$	—	$63\frac{1}{2}O$
4. *Oxygenated Volatile Oils, and Allied Acids*—							
Oil of bitter almonds	C_7H_6O	=	$7CO_2$	+	$3H_2O$	—	16O
Benzoic acid	$C_7H_6O_2$	=	$7CO_2$	+	$3H_2O$	—	15O
Oil of cinnamon	C_9H_8O	=	$9CO_2$	+	$4H_2O$	—	21O
Cinnamic acid	$C_9H_8O_2$	=	$9CO_2$	+	$4H_2O$	—	20O
5. *Oily and Fatty Acids*—							
Acetic acid	$C_2H_4O_2$	=	$2CO_2$	+	$2H_2O$	—	4O
Butyric acid	$C_4H_8O_2$	=	$4CO_2$	+	$4H_2O$	—	10O
Valerianic acid	$C_5H_{10}O_2$	=	$5CO_2$	+	$5H_2O$	—	13O
Stearic acid	$C_{18}H_{36}O_2$	=	$18CO_2$	+	$18H_2O$	—	52O
6. *Resins and Camphors*—							
Many resins	$C_{10}H_{14}O$	=	$10CO_2$	+	$7H_2O$	—	26O
Camphor	$C_{10}H_{16}O$	=	$10CO_2$	+	$8H_2O$	—	27O
Borneo camphor	$C_{10}H_{18}O$	=	$10CO_2$	+	$9H_2O$	—	28O
7. *Carbo-hydrogens*—							
Oil of lemons	$C_{10}H_{16}$	=	$10CO_2$	+	$8H_2O$	—	28O
Oil of turpentine	$C_{10}H_{16}$	=	$10CO_2$	+	$8H_2O$	—	28O
Oil of juniper	$C_{10}H_{16}$	=	$10CO_2$	+	$8H_2O$	—	28O
Cumole	C_9H_{12}	=	$9CO_2$	+	$6H_2O$	—	24O
Cymole	$C_{10}H_{14}$	=	$10CO_2$	+	$7H_2O$	—	27O

A glance at the composition of these seven groups shows that they present a series of deoxidations, till in the sixth, very little oxygen, and in the last, no oxygen whatever is left. Thus, leaving out of view, for want of space, the compounds in which nitrogen and sulphur enter, "oxalic acid is first formed, and then malic, tartaric, citric, etc., acids from it or from each other; then sugar, starch, etc., from the acids; bitter, acrid, and colored compounds from the sugar, starch, etc.; then oxygenated volatile oils; and then acids perhaps also from sugar, etc.; then the oily and fatty acids, either from the preceding oils and acids, or from sugar; then the resins from the fats, or from sugar; and lastly, the carbo-hydrogens. Thus, we have a picture of the whole process of vegetation

* In this group, which is very numerous, compounds of a most discordant character appear. Of the specimens we have selected, the first closely resembles a sugar; the second is a pure bitter; the third, a gelatinizing substance; the fourth, a pigment, and the fifth, an acrid poison.

as far as concerns compounds devoid of nitrogen and sulphur; and we find it uniformly to be one of deoxidation."—Gregory, *op. cit.*, p. 548. To produce nitrogenous compounds, such as asparagine, amygdaline, nicotine, morphine, caffeine, etc., it is only additionally necessary that ammonia should be present, and the plant by a similar process gives rise to nitrogenous products, the process being shown as below:

Asparagine	$C_4H_8N_2O_3$	=	$4CO_2$	+	H_2O	+	$2NH_3$	—	6O
Amygdaline	$C_{20}H_{27}NO_{11}$	=	$20CO_2$	+	$12H_2O$	+	NH_3	—	41O
Nicotine	$C_{10}H_{14}N_2$	=	$10CO_2$	+	$4H_2O$	+	$2NH_3$	—	24O
Morphine	$C_{17}H_{19}NO_3$	=	$17CO_2$	+	$8H_2O$	+	NH_3	—	39O
Caffeine	$C_8H_{10}N_4O_2$	=	$8CO_2$	—	H_2O	+	$4NH_3$	—	13O

It is easy to show how the sulphur contained in certain oils (oil of garlic, $(C_3H_5)_2S$, for example) is probably obtained by the reduction of the sulphuric acid existing in the sulphates of the soil; but the composition of the albuminates containing both sulphur and nitrogen is so complex that we cannot venture to attempt a popular explanation of the mode of formation of these matters from the simple food of plants. On this subject the reader may consult Liebig's *Agricultural Chemistry*, *Letters on Chemistry*, and *Laws of Husbandry;* Mulder's various works (a new edition of his great work is now being translated, in parts, into German); Rochleder's *Phytochemie*, and the portion of Gregory's *Organic Chemistry*, and of the third volume of Gorup-Besanez's *Handbuch der Chemie*, devoted to this question.

VEGETABLE IVORY. See Ivory, Vegetable.

VEGETABLE MARROW. See Gourd.

VEGETABLE PARCHMENT. See Parchment, Vegetable.

VEGETABLE PHYSIOLOGY. All the most important departments of this subject have been already noticed in this work under the various headings of Circulation of Sap, Flower, Fruit, Leaves, Metamorphosis of Organs, Plant, Root, Seed, Spore, Stem, etc. We shall therefore here only discuss one subject, which has not been separately considered—namely, the organs and functions of reproduction in plants. Although, as we learn from Herodotus, the Babylonians knew that there were male and female date-trees, and that the female required the concurrence of the male to become fertile, and Theophrastus in his work *On the History of Plants*, and other ancient authors, frequently mention the sexes of plants, Cæsalpinus, who died at Rome in 1603, seems to have been the first writer who directed his attention to the reproductive organs of plants; and he speaks vaguely of an emanation from the male causing fertility in the female; and Grew, in 1676, seems to have been the first who distinctly recognized the functions of the stamens and pistils. Ray, in his *Historia Plantarum*, 1694, adopted and enforced Grew's view; and Geoffroy, in 1711, read a memoir before the royal academy supporting the same view. Linnæus, in his *Systema Naturæ* (1748), made these organs the foundation of his system of classification into sexual and non-sexual plants, the former being phanerogamous, or flowering, and the latter cryptogamous, or flowerless; in the latter division of plants, he could not detect stamens or pistils; and it was not till 1782, when Hedwig's work on mosses was published, that anything was known with certainty regarding the sexual organs of any of the cryptogamia. From this brief notice of the early history of this subject, we proceed to the consideration of reproduction in the phanerogamous plants. A complete flower consists, as is well known, of four whorls (*verticils*), placed alternately within one another, the two internal being the *stamens* (q.v.) and *pistils* (q.v.), which are the essential organs of reproduction; while the two external are the *calyx* and *corolla*, which constitute the floral envelopes or protective coverings.

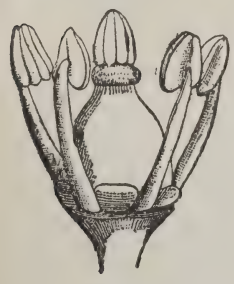


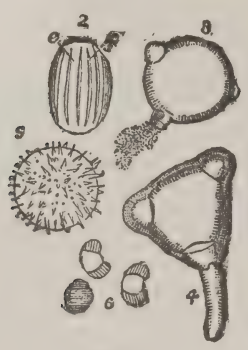
Fig. 1.

Androecium and gymnœcium (or, in other words, the stamens and pistil) of the vine, with the disk surrounding the base of the ovary.

Both the stamens and the pistils originate, like the floral envelopes (see Flower), from the thalamus, or upper part of the axis or peduncle, in the form of minute cellular processes; and in their development they resemble leaves, although in their appearance, they are less like leaves than are the floral envelopes. These parts are well seen in the accompanying diagram (fig. 1) of the flower of the vine, after it has cast its petals. There are here five stamens (the filament of one being concealed by the pistil), with introrse* two-lobed anthers. As separate articles are devoted to Stamens and Pistils, it is unnecessary to enter into any details regarding their anatomical structure. A few additional remarks on the pollen are, however, called for. This (the male fertilizing agent) consists of cells contained in the anther case, and is discharged by various kinds of longitudinal, transverse, valvular, or porous dehiscence. When examined by the naked eye, it usually appears as a yellow powder; but when magnified, it is found to consist of cellules of different singular forms, varying in size from $\frac{1}{300}$ to $\frac{1}{700}$ of an inch in diameter. Oval, spherical, and triangular forms of pollen are shown in figs. 2 to 6; and they may be square cylindrical hour-glass shaped, etc. These pollen-grains are developed in the large cells in the early stage of the anther. The contents of each cell

* This term is applied to anthers which open on the side next the pistil.

divide first into two, and afterward into four parts, each of which becomes covered with cellulose, so as to constitute independent cells or grains. These grains either burst through the parent cell, and become liberated, or they remain united in fours or some multiple of four, as in many species of acacia; or, in large masses, such as those seen in orchids and in asclepias, when they constitute *pollinia*. Each pollen-grain has usually two coverings: the outer one, called *extine*, being a firm membrane, often marked with bands or rough points; and the inner one called *intine*, which is thin, and capable of extension. In the interior of the pollen-grains, a minute granular matter exists, called *fovilla*—the granules, which are mixed with starch and oil, varying from $\frac{1}{4000}$ to $\frac{1}{30000}$ of an inch in diameter. On moistening pollen-grains in water, they swell till the intine bursts at one or more points, and expels the fovilla. In the act of impregnation the pollen is scattered on the pistil, and is moistened on one side by the fluid of the stigma (a part of the pistil composed of loose cells, which secrete a viscid fluid, and are uncovered by epidermis). It is then observed that the intine, instead of bursting, protrudes in the form of a tube called the *pollen-tube*. The number of these tubes varies greatly in different plants. According to Amici (as quoted by Balfour, to whose useful *Class-book* we are indebted for most of our facts and illustrations), the two pollinia of *orchis morio* contain each about 200 secondary small masses, composed of grains united in fours, and each of these small masses presents 300 openings capable of emitting tubes. In order that an embryo plant



FIGS. 2 to 6.

Fig. 2.—Elliptical pollen of milkwort (*polygala*), viewed lengthwise. Its surface, or extine, *e*, is marked with grooves or slits, *f*, where the intine protrudes. Fig. 3.—Ripe round pollen of cherry (*cerasus*) discharging its fovilla through a tubular opening formed by the intine. There are two other points at which the intine is seen protruding. Fig. 4.—Triangular pollen of evening primrose (*œnothera*), with one pollen tube protruding. This tube is formed by the intine, which is also seen projecting at the other angles. Fig. 5.—Round ripe pollen of hollyhock (*alcea*), with its extine, covered with prominent points. Fig. 6.—Pollen of fir (*pinus*), in which, by the increase of the intine, the extine is separated into two hemispherical portions marked by the dark spaces at each end of the grains.

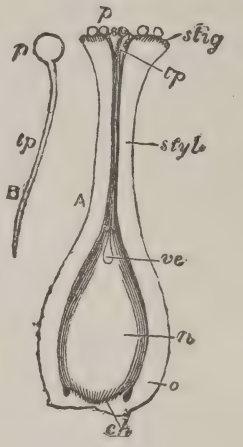


FIG. 7.

Pistil and pollen of polygonum. A, stigma, *stig*, with pollen-grains, *p*, adherent to it, sending tubes, *tp*, down the conducting tissue of the style, *styl;* the ovary, *o*, containing the ovule with its covering and central cellular mass or nucleus, *n*, containing a rudimentary embryo-sac *ve*, in which ultimately the embryo is developed. The base of the ovule attached to the placenta, is marked by the chalaza, *ch*. B, pollen-grain, *p*, separated, with pollen-tube, *tp*.

may be formed, the mature pollen must be discharged from the anther cells of the stamen, and brought into contact with the stigma, through which, and then through the conducting tissue of the style, it must pass until it reaches the foramen, or micropyle, of the ovule. The means by which this contact is accomplished are various, such as elasticity and irritability of the stamens, the action of currents of air, and the intervention of insects passing from the male to the female plant. In the case of the orchids, fertilization is solely effected by the agency of insects. The fertilizing power of pollen is retained for a different length of time in different plants: thus, while in most species of datura, and in *lychnis dioica*, it loses its power in two days, in the wall-flower it remains efficacious for 14 days; while in the date, cannabis, tea, and camellia, it will keep fresh for a year; indeed, Micheaux mentions that the pollen of the date has been successfully used after 18 years! The quantity of pollen that is produced is much greater than is actually required for the impregnation of the ovules. Thus, in the firs and pines, the quantity is enormous, probably because of the obstacles here presented to fertilization. The *sulphur showers* occurring in some districts are composed of the yellow pollen carried by the winds from pine forests; and the showers of colored rain which are occasionally noticed are due to a similar cause. The number of pollen-grains in certain flowers has been calculated. In a plant of *cereus grandiflorus*, Morren observed that there were 40 flowers, each containing 500 stamens, and that each anther contained 500 pollen-grains; hence the entire number of pollen-grains in each flower was 250,000, and in the

whole plant is 10,000,000. Similarly, in an entire rhododendron plant, the pollen-grains amount to 72,620,000. The quantity required for fertilization is very small—one, two, or at most three grains being sufficient to impregnate one ovule. In most cases, the pollen of a single anther is sufficient for complete impregnation; the additional anthers being, as it were, added for the purpose of insuring the result. During the evolution of the stamens, and the maturation of the pollen, the pistil undergoes certain changes, of which the most important is that the stigma becomes enlarged, lax, and covered with a viscid secretion, which, besides detaining the pollen-grains, causes them to protrude their tubes, as already described; moreover, in some flowers the style, which is sometimes covered with hairs, elongates during the discharge of the pollen, brushes the latter on to the pistil, and thus acts directly in fecundation. One of the central cells of the ovule now becomes much enlarged and developed, so as to form the embryo sac. At the end of this sac, next to the micropyle, several free nucleated cells are formed, to which the name of embryo vesicles, or germinal vesicles, has been given. In this way the ovule is prepared for the action of the pollen, and for the production of the embryo plant. The tubes developed by the pollen-grains, when acted on by the secretion of the stigma, pierce the stigmatic tissue, and carry the fovilla through the canal of the style to the ovule, as shown in fig. 7. In some plants the emission of tubes begins in half a minute after the pollen has been caught by the stigmatic secretion; in other cases it does not begin for 24 hours or more; and it is said that in the larch, the tubes do not emerge for 35 days. The length to which the tubes extend is often very great, but the diameter is extremely small. In *colchicum autumnale*, in which the style is 13 in. long, the length of the tube is 9,000 times the diameter of the grain from which it proceeds. The time taken by the tube to traverse the length of the style varies, but does not always correspond with the latter. In some short-styled plants, the time is very long, while in the long-styled *colchicum autumnale*, the pollen-tube reaches the ovule in about 12 hours. In some coniferous plants a year is required for the process.

We now proceed to consider the embryogeny of (1) gymnospermous and (2) angiospermous phanerogams. In the gymnospermous or naked-seeded flowering-plants, such as the coniferæ and cycadaceæ, impregnation is effected by direct contact between the pollen and the ovule, there being no true ovary bearing a stigma. The process is thus summarized by Balfour: "In gymnospermous plants, there are stamens containing pollen, and ovules supported on cones or altered branches, and in them the pollen enters the large micropyle of the ovule without the intervention of stigma or style. When the pollen reaches the nucleus of the naked ovule, it remains long dormant, and after many weeks and months, sends out a tube which reaches the embryo sac, and impregnates a corpuscle. One of the cells of the corpuscle then takes an active function, and develops the embryo with the suspensor in the midst of endospermal cells."—*Op. cit.*, p. 600. In the angiospermous phanerogams, when the pollen-tube has traversed the tissue of the style, and reached the ovule, it proceeds through the foramen, or micropyle, so as to come in contact with the embryo sac; and consequent on this is the development of the cellular embryo. There is, however, much dispute as to what now occurs. "Schleiden thinks that the end of the pollen-tube introverts the embryo sac, and in some cases perforates it, and that it becomes the first cell in the embryo. Most physiologists, however, agree in thinking that Schleiden was mistaken in regard to the extremity of the pollen-tube, and they believe that the embryo is formed from a distinct cell previously existing in the embryo sac. In some instances, the pollen-tube indents the embryo sac, at other times it perforates it, and comes into actual contact with a cell contained in the sac. In the embryo sac there are produced, before impregnation, certain cells, often three, which are called germinal vesicles, only one of which in general is impregnated by the pollinic fluid, which transudes through the membrane of the pollen-tube and the walls of the embryo sac and vesicles. After impregnation, the vesicle divides by a transverse septum into two parts, the upper portion forming a confervoid partitioned filament or suspensor, and the lower becomes filled with cells, constituting the rudimentary embryo. The suspensor is attached to the part which forms the radicle of the embryo, and at the opposite end, one or two cotyledons are produced, inclosing the fresh bud or plumule. An embryo is usually produced in each ovule (monembryonomy); but when more than one germinal vesicle is impregnated, there is a plurality of embryos (polyembryonomy). When the pollen of one species is applied to the pistil of another species, we occasionally find seeds produced which give rise to individuals intermediate between the two parents: these individuals are called hybrids or mules, and are rarely fertile. A plant has, however, a preference

FIG. 8.

Section of part of the ovule of a species of Speedwell (*Veronica triphyllos*), showing the pollen-tube, *a*, passing through the cellular tissue of the nucleus, and reaching the embryo-sac, which contains the rudimentary embryo, *d*, attached to the sac by its suspensor, *b*, and endospermal cells, *e*, at the lower part of the sac.

for the pollen of its own species, and hence hybrids are rare in nature."—Balfour, *op. cit.*, p. 600. A reference to the preceding figure of a section of part of the ovule of a species of *Speedwell*, will elucidate the above summary: it shows the pollen-tube *a*, just as it reaches the embryo sac which contains the rudimentary embryo, *d*, attached to the sac by its suspensor, *b*, and endospermal cells, *c*, at the lower part of the sac. The suspensor is sometimes of considerable length, and as much as three, or even five times the length of the whole seed. Its attachment to the radicular end of the embryo is shown in fig. 8. In monocotyledons, a single sheathing cotyledon is developed; in dicotyledons, two opposite leaves; and after their formation, the apex produces the terminal bud or plumule. The embryo is thus suspended in an inverted position in the seed.

It is impossible to enter into any general description of the organs or process of reproduction in cryptogamic plants. In this great division of the vegetable kingdom, the organs of reproduction are in general obscure, and consist usually of cellular sacs of two kinds—one being called *antheridia*, containing *phytozoa* or *spermatozoids*, representing the stamens, or the male; and the other being called *pistillidia* or *archegonia*, and representing the pistil, or the female. In the fully developed state of the plant, the antheridia disappear, while the pistillidia are transformed into cellular sacs containing germinating bodies known as spores (q.v.), which are considered as being formed by a process of reproduction, and as being analogous to cellular embryos. These spores are developed in mother-cells, the contents of which often divide into four, such mother-cells being called sporidia. With regard to the antheridia and the pistillidia in the different orders of cryptogamic plants, Dr Balfour observes that in ferns they are supposed to exist in a pro-thallus or cellular expansion produced by the spore when it germinates. A cell of the pistillium (the ovular body) afterward gives rise to the spore-bearing leaves (the fronds). After impregnation, the archegonial cells give rise to a sporingiferous frond. The spores are contained in sporangia, with or without an elastic ring, developed on the back, on the side, or at the base of the leaves. In mosses, these organs are seen at certain stages of the plant's growth, and they are either on the same or on different plants. After impregnation, the archegonial cell gives rise to a stalked theca or sporangium with its spores. In liverworts, they are usually on different parts of the plant, and as frequently in the substance or on the under surface of disk-shaped cellular stalked expansions. Here the impregnated cell gives rise to the fruit or capsules. In lichens, the existence of these organs has not been already established; and the fructification consists of *thecæ* or *asci*, containing 4, 8, 12, or 16 sporidia (or cells containing spores) in their interior. These thecæ are usually united together so as to form a cup-like mass of fructification. When mature, the sporidia or thecæ burst, and discharge the spores. The fungi, antheridia, and pistillidia are obscure, and the organs of reproduction are spores which are either naked or are contained in thecæ. In algæ, antheridia and pistillidia have often been detected; but in some of them, certain cells, in the same or separate filaments, seem to possess the property of producing spores by a process of conjugation or union; and in the lowest forms the cells undergo division into new individuals.

Besides the above-noticed modes of propagation, cryptogamic plants are also propagated by buds or gemmæ, which are either attached to the leaves or fronds, or are contained in peculiar cup-shaped bodies. See Carpenter's *General and Comparative Anatomy*, and Balfour's *Class-book of Botany*, from which we have borrowed freely.

VEGETABLE TISSUE, the term employed in botany to denote the whole substance of which plants consist; regarded according to its structure, rather than to functions or chemical composition. See Cellular Tissue and Vascular Tissue.

VEGETARIANISM, the doctrine that vegetable substances are the solids intended by nature for the sustenance of man, and that it is wrong—against nature and against good morals—for men to make use of an animal diet. There have never been wanting among speculative persons some who maintained that fruits and vegetables are the proper food for men; and illustrious names, such as those of Pythagoras, Plato, Plutarch, in ancient times—of Rousseau, Shelley, Swedenborg, in modern, can be counted among the upholders of this doctrine. A society for promoting the practice of vegetarianism was established at Manchester in 1847; and three years later, a similar society was established in the United States. Besides a short-lived publication called the *Vegetarian Advocate*, the vegetarians in Great Britain have been represented by the *Vegetarian Messenger* (monthly), from 1849 to 1859; for one year by the *Journal of Health;* from 1861 to 1871 by the *Dietetic Reformer and Vegetarian Messenger* (quarterly); and since 1871 by the *Dietetic Reformer* (monthly). The vegetarian creed has attracted very few disciples in England; and by these the advocacy of it has usually been conjoined with that of temperance, peace, homeopathy, and the cold-water cure.

There is, first, a physiological argument used in behalf of vegetarianism. It is said that the formation of the teeth and of the intestines in man proves that man was not intended to be a carnivorous, but a fruit and vegetable eating animal. Then it is maintained that a vegetable diet is the most favorable to man, in all respects, physical, intellectual, and moral; that with it, his life is longer, his enjoyment of life greater, his brain more vigorous, and his power of manual labor not less than with an animal diet; and that,

while the use of animal food begets ferocious dispositions, a carelessness about life, a callousness to the sufferings of men or animals, a vegetable diet "develops the gentler affections, and produces a broad and genial sense of brotherhood." It is affirmed that animal food produces febrile and inflammatory tendencies; that, like alcohol, it is a stimulant (some vegetarians call it a stimulating poison); and that a mixed diet is open to all the objection which lie against moderate drinking. It is also alleged that animal food as exposed for sale is often tainted with some disease or unwholesome condition, and that it thus becomes a frequent cause of disease in men. Moreover, it is submitted that vegetables contain all the principles necessary for the sustenance of man; that, therefore, the use of flesh is unnecessary; and that this being so, it is selfish, cruel, and tyrannical—calculated, too, to increase selfishness, cruelty, and tyranny in men—to cut short the existence of inferior animals.

The opinion of physiologists is not favorable to vegetarianism. The structure of man's organs is held to prove that nature intended him for an omnivorous animal, his stomach and intestines being fitted for deriving nourishment from every kind of food, and he being able, by means of cooking, to modify his food so as to prepare it for mastication and digestion. There is also almost a concurrence of medical experience against vegetarianism, and in favor of the opinion that man, as regards all his powers and faculties, thrives best, and that—if a difference can be made out—he also lives longest upon a mixed diet. It has been found, in making railways, that differences between workmen in respect of bodily strength and energy were chiefly due to a difference of diet; that, for example, a beef-eating Englishman would almost do the work of three vegetable-fed Frenchmen, and that this difference of working-power disappeared when the Frenchmen took to eating beef. Upon the alleged beneficent moral influence of vegetable food, it may be observed that there is no proof whatever of its reality; moreover, that since the majority of mankind live either mostly or entirely upon vegetables, vegetables must bear a large share of the responsibility which may fall upon diet for the evil tendencies of man, and that, in fact, the most cruel and the most debased of human races live entirely upon vegetables. To the charge of cruelty brought against the practice of killing animals for food, it has been answered, that the plan of nature contemplates such cruelty—if cruelty it be—and makes it impossible to avoid it; that the microscope has shown us that even in taking a draught of water we may deprive a multitude of beings of life; and that, on the other hand, the system of rearing cattle for the butcher—since the cattle would otherwise not be reared at all—really adds very largely to the sum of happy animal existence. It is not disputed that there is a liability to disease from the use of unwholesome meat; but, then, vegetables as well as animals are subject to diseases: and the reasoning which would drive us from the use of animal food because it may be diseased, would really cut us off from food altogether.

VE'GLIA, an island of Austria, in the Adriatic sea, belonging to the government of Triest; pop. 19,871. The channel of Morlacca separates it from the main-land and the islands of Cherso and Plannich on the s.w. It is 23 m. long and 12 m. in width. The coast is bold and rocky. The surface is mountainous and well timbered, and the soil in the s. and w. is fertile, producing wine and a variety of fruits. The chief mineral product is marble, and the principal industries are connected with the fisheries. On the s.w. coast is the town of Veglia, with a harbor and fort and a pop. of about 2000.

VEHMGERICHTE. See FEMGERICHTE.

VEHSE, KARL EDUARD, 1802–70; b. Germany; appointed head of archives department at Dresden in 1833. He traveled in the United States in 1839, was expelled from Prussia for his remarks about the royal family in his *Geschichte der deutschen Höfe Seit der Reformation*, 1851–58, and naturalized in Switzerland in 1857. He published *Geschichte Kaiser Otto's des Grossen* in 1828.

VE'II, an ancient city of Etruria in early times the formidable rival of Rome. Its very site is disputed, but is now generally thought to be at *Isola Farnese*, about 12 m. from Rome. The struggle between the two cities is recorded by Roman historians to have commenced as early as the time of Romulus, and to have continued under each of the kings, except the pacific Numa, and always to the advantage of the Romans. The Veientines had their revenge so far under Porsena; but after his time, being convinced by repeated defeats that they were no match for their enemy in the open field, they had recourse to the plan of sheltering themselves behind their walls on the approach of the Roman legions, and of sallying out on predatory expeditions as soon as they had retired. To relieve the republic from this annoyance, the Fabian clan, to the number of 306, with their followers, probably ten times as numerous, undertook to garrison a fortress near Veii, and act as a guard against the marauders. They were, however, enticed into an ambuscade, and cut off to a man at the Cremera. For the next 60 years, hostilities often broke out, followed by ill-observed truces. At last, the Romans determined to rid themselves of their rival by a siege, and persevered with great tenacity, though the city held out for ten years, and repeated attempts were made by the neighboring states to relieve it. It is said to have been taken at last by a mine, which was directed so as to lead into the citadel. The citizens were massacred or sold as slaves, and the land confiscated. The fall of Veii took place 396 B.C. It was debated more than once, especially after the destruction of Rome by the Gauls, whether Rome should

not be abandoned, and Veii made the capital. After its fall, it was gradually deserted; and although, in later times, a colony was planted there by Cæsar, and again by Augustus, it always remained an insignificant place. There are remains of the Etrurian, and also of the Roman city, which have latterly been traced out and described.

VEIL. This familiar article of dress is one of the most ancient in use; its origin is lost in remoteness, but we find an allusion to the wearing of veils by the Chinese in Ovid, and Juvenal speaks of women as being so delicate as to be overheated by a silken veil. Although generally considered portions of female dress, we read in the works of Ambrose (374 A.D.), of "silken garments and veils interwoven with gold, with which the body of the rich man is encompassed." Its use is now so extended that it may be found in every part of the civilized world, but almost exclusively confined to women.

VEINS, in anatomy, if we except the pulmonary, the portal, and the umbilical veins, are the vessels which carry back venous blood from the capillaries, and enlarging as they proceed, finally pour it through the ascending and descending *venæ cavæ* into the right auricle of the heart. See CIRCULATION. Their coats are similar to those of the arteries, but much thinner, and even transparent. They are, however, of considerable strength. The *internal coat* consists of an epithelial layer, supported on several laminæ of longitudinal elastic fibers. The *middle* or *contractile coat* consists of numerous alternating layers of muscular and elastic fibers, the muscular fibers being disposed circularly round the vessel. The muscular fibers are wanting in some parts of the venous system, and specially developed in others (as, for example, the splenic and portal veins, where, perhaps from the physical character of the tissues which they pervade, there may be more than the ordinary resistance to the passage of the blood). In the *venæ cavæ* and pulmonary veins near the heart, striped muscular fibers may be detected, continuous with those in the auricles. The *external* or *areolar fibrous coat* consists of connective or areolar tissue, and of longitudinal elastic fibers; within some of the larger veins, as the inferior *vena cava*, through its whole length, the external iliacs, the azygos, etc., there is also a longitudinal net-work of unstriped muscular fibers. The existence of valves in the veins is mentioned in the article CIRCULATION. These valves are most numerous in the veins of the extremities, especially the lower ones, these vessels having to act against the force of gravity more than most others. They are absent in the *venæ cavæ*, the hepatic, portal, renal, pulmonary, and some other large veins, and in very small veins generally. The veins are nourished by nutrient vessels, or *vasa vasorum*, like the arteries; but except in a few instances (including the inferior *vena cava*), nerves are not distributed to them.

The chief diseases of the venous system have been already sufficiently described in the articles PHLEBITIS, OR INFLAMMATION OF THE VEINS; PHLEBOLITES; PHLEGMASIA ALBA DOLENS, OR MILK-LEG; THROMBOSIS; and VARICOSE VEINS. We shall here merely refer to two conditions of the venous system which must be regarded as the results of natural rather than morbid action: they are *hypertrophy* and *atrophy*. Hypertrophy is a natural and healthy change, which will be readily understood by one or two illustrations. When the uterus enlarges during pregnancy, the quantity of blood in it increases in at least a corresponding ratio, and so also do the venous canals by which it is removed; while shortly after delivery, they return to their natural size; the hypertrophy being accompanied with a proportionate dilatation. This form of hypertrophy, with dilatation, often exerts a compensative action, one vein, or set of veins, taking additional work (and consequently requiring an increase of caliber), to make up for the partial or entire occlusion of another. When, for example, the ascending vena cava is diminished in size, or even entirely and permanently closed, it is well known that the lower portion of the vessel dilates in common with the branches entering into it, and that the superficial abdominal veins or azygos, or both, become enlarged, and thus carry to the heart the blood which ought to have reached the heart by the usual course. If the obstruction is only temporary, the enlarged veins return to their original state, except that additional transverse fibers are found in the middle coat. Atrophy of the veins accompanies the corresponding changes of other tissues, when a part is permanently diseased. Amputation above the knee soon reduces the femoral vein to less than one-third of its previous size. Mr. Callender, in his article on diseases of the veins, in Holmes's *System of Surgery*, states that in the case in which a kidney became transformed into a large cyst, the canal of the renal vein was impervious to a common probe; and this condition is daily seen in the change which occurs in the umbilical vein shortly after birth.

VEINS, in geology, are crevices, more or less vertical, caused by the contraction during drying or metamorphoses, or by the mechanical disturbance of a rock, which have been filled by materials different from the body of the rock. Veins containing substances that have been injected in a state of fusion from heat, have had their origin in some internal force; while those filled with mineral deposits may or may not be connected with upheaval. Granitic and trappean veins differ from dykes chiefly in the greater size of the latter. They produce similar changes in the rocks which they penetrate, indurating clays and sandstones, and converting limestones into marble, or giving them a compact texture like hornstone. Granite veins are generally more sinuous in their course than those of trap. One set of veins often intersects another, having been produced at a later period; and the two sets generally differ in color, grain, and even

mineral composition. Granite generally assumes a fine grain, and is even different in composition in the veins it sends into the adjoining rocks. Mineral veins are filled with different kinds of crystalline minerals. Quartz and calcite are the most common of these substances; but frequently several different minerals occur in the same vein, some of these being metallic ores. Veins of the same age are filled with the same metals, and generally maintain a general parallelism of direction. Thus, the tin and copper veins of Cornwall run nearly e. and w.; while the lead veins run n. and south. Three kinds of veins are distinguished by the miners—rake, pipe, and flat veins. The rake veins are simple crevices, crossing all the rocks of a series, generally highly inclined, and apparently formed from the contraction of the rock. The two originally opposite surfaces may retain their relative positions, only separated by the interposed contents of the veins; or a fault may place the originally contiguous surfaces at different levels; and in such a case, the intervening spaces between the walls of the vein are irregular, sometimes narrowing so that the walls are in contact, and then widening out, and forming large cavities containing ores. The pipe veins are irregular cavities, filled with minerals, and without any apparent connection with faults in the strata. Flat veins have a general direction corresponding with that of the stratification, and are connected sometimes with rake veins, and sometimes with pipe veins. The manner of working the minerals contained in veins is explained in the article MINING (q.v.).

VEIT, PHILIPP, a distinguished German painter, was born at Berlin, Feb. 13, 1793. His mother, a daughter of Moses Mendelssohn, had for her second husband, Friedrich Schlegel, and Veit became devotedly attached to the religious and artistic ideas of his stepfather, whom he followed in his renunciation of Protestanism for Roman Catholicism. After finishing his studies at Dresden, he proceeded to Rome in 1815, and became a very prominent member of that coterie of young German painters who sought to infuse into modern art the purity and earnestness of mediæval times. Of all the associates, Veit ventured furthest into the obscure realms of symbolism and allegory. His first famous work was the "Seven Years of Plenty," executed as a companion-piece to Overbeck's "Seven Years of Dearth," and forming part of a series of frescoes illustrative of the history of Joseph, painted at the Villa Bartholdy in Rome. In richness and freshness of invention, it is reckoned one of the best works of the school to which it belongs. Other pictures of a high order of merit, done during his residence at Rome, are "The Triumph of Religion" (Vatican galley), "Scenes from Dante's *Paradiso*" (Massimi Villa), and an altar-piece, representing "Mary as Queen of Heaven" in the Trinità de' Monti. These procured him so great a reputation that he was called to the directorship of the Städelsche art institute, in Frankfurt-on-the-Main. While holding this position, he produced many grand pictures, of which the most celebrated is the large fresco (at the institute), representing "Christianity bringing the Fine Arts to Germany," held by many to be the finest fresco by any modern artist. Others are, "The Two Maries at the Sepulchre," and "St. George." In 1843 he resigned his post as director, and removed to Sachsenhausen, in Hesse-Cassel. Among his later works are, "The Ascension of the Virgin," "The Good Samaritan," "The Egyptian Darkness," and "Glorification of the Christian Faith in its Alliance with the Reigning House of Prussia," for the king of Prussia. In 1868 he painted several frescoes for the Mayence cathedral. He died, December, 1877.

VE'LA, VINCENZO, b. Switzerland, 1822; in youth a stone-cutter; in 1836 studied drawing and worked in studios at Milan. He afterward spent some time in Rome and Venice and settled in Turin, 1849. He produced a number of statues and bas-reliefs; among which are "Spartacus;" "Harmony in Tears;" "France and Italy;" "Columbus and America;" and "Napoleon in St. Helena;" the last two now in possession of the Metropolitan art museum, New York. He d. in 1891.

VELASQUEZ, DIEGO RODRIGUEZ DE SILVA, one of the most famous of Spanish painters, was b. at Seville, in June, 1599, of a family of Portuguese origin. Very early, the bent of nature became obvious in him; and he was sent to be educated in the studio of Francisco Herrera el Viejo, an artist of considerable force and originality. He afterward became the pupil of Francisco Pacheco, a man accomplished in theory, but who could practically teach him little. The old pedant had, however, an attractive daughter, named Juana, who, doubtless, to the eyes of the young painter, atoned for her parent's deficiences, and who married him at the end of 5 years. His chief education, however, as with all men of real genius, was that which he gave himself; he painted assiduously from the life; the models he selected were, for the most part, of the sordid peasant class, and in this way a certain habit of mind was induced, unfavorable to the attainment of that pure and elevated ideal, some infusion of which is all that is wanted to elevate the noble realistic hardihood of his manner into the very highest region of the art. In 1622, he paid a visit to Madrid, to study the treasures of art there accumulated. During his stay, he painted the portrait of the poet Gongora, and made some influential friends, at whose instance he was, the year after, invited to return by the conde, Duque de Olivarez, the favorite of Philip IV. His portrait of this magnate so delighted the king, that he himself sat to the artist, and the result was a picture of superb merit by the public exhibition of which the artist at once became famous. The office of court-painter was bestowed upon him, and he found himself at once embarked on a full tide of the prosperity which continued through life to flow upon him. Of Philip IV. and his fam-

ily he painted many pictures; and shortly after his appointment, he executed a portrait —unfortunately lost—of Charles I. of England, then (1623) at Madrid on his famous fool's errand. The year 1628 was made memorable to him by the arrival, in Madrid, of the great Rubens, on a diplomatic mission The two artists were worthy to become friends, and speedily became so; but though Rubens, during his stay, was assiduous in the practice of his art, the familiarity of Velasquez with his florid harmonies of color and riot of animal vigor, seems to have exercised no modifying influence on the restrained gravity and severity of his own style, now thoroughly matured.

Velasquez had long desired to visit Italy; and in 1629, permission was granted him to proceed thither. Everywhere he was received with the highest honors; and in Rome, in particular, Pope Urban VIII. assigned him apartments in the Vatican. Here he chiefly employed himself in copying the frescoes of Raphael and Michael Angelo; and it is remakable that, in the one or two original pictures which he at this time produced, no hint of an influence can be traced from his studies of these mighty masters. He was not the less profoundly sensible of their power; though he has left it on express record, that of all the Italians he considered Titian the greatest. Such, however, was his powerful individuality, that his own style once formed, no such external influence was able to affect it appreciably. Having recovered from a severe illness, he proceeded to Naples; and finally, in the spring of 1631, returned to Madrid, where he was cordially welcomed by his royal patron, with whom he now became more and more a favorite. He had a painting-room in the palace assigned him; and the king was wont to come familiarly to watch him at work. It is a noble trait in the man, which deserves to be recorded along with his triumphs as an artist, that when, in 1643, the Duque de Olivarez, to whom he had been indebted while yet obscure, incurred disgrace at the hands of Philip, he braved the royal displeasure, by continuing to show him in everything the respect to which he had been accustomed. In 1648 Velasquez proceeded again to Italy, on a mission from the king to buy pictures and other works of art. He returned to Madrid in 1651; after which time many of his finest works were painted. Such was the favor in which he continued to be held by Philip, that, in 1656, the cross of Santiago was conferred on him, an honor never before awarded except to the highest of the nobility; and shortly after, he was appointed aposentador mayor. This post, the duties of which consisted in attendance on the king in his journeys, and superintendence of everything essential to his convenience, was one of much honor and emolument; but it involved at times great trouble and anxiety; and on the specially important occasion of the conferences held, in 1660, to arrange the marriage between Louis XIV. and the Infanta, these were such as to utterly prostrate the painter. On July 31 of that year, he returned to Madrid, worn down with the overwork to which he had been forced to subject himself, and died in a week after, on Aug. 7. He was buried with much ceremony in the church of San Juan. His wife, who was passionately attached to him, only survived his loss about a fortnight.

Velasquez—with the doubtful exception of Murillo—takes admitted rank as the greatest of Spanish painters. His portraits are, for force, penetration, directness, and severity of truth, of almost unrivaled merit; his historical pictures are also of rare value; his landscape effects are full of air and light; and his treatment of religious subjects only fails in defect of that deeper spirituality, the expression of which has been in its fulness attained by none save a few of the earlier Italians. The works of Velasquez are in this country rare. The few specimens to be found in the national gallery in London inadequately represent his genius, of the power and variety of which a worthy conception is only to be formed at Madrid. See Stirling-Maxwell's and Stowe's works.

VELEZ-MALAGA, a t. in the s. of Spain, in the modern province of Malaga, and 16 m. e. of the city of that name. It stands at the foot of a hill which forms part of the south range of the Sierra Tejada, and rises with its fortress and its spires overlooking the river Valez, at a distance of less than two miles from the shore of the Mediterranean. The climate, said by the Andalusians to be "that of heaven," is delightful; and owing to the abundance of moisture supplied by the hill-streams from the north, and the heat of an almost tropical sun, the vegetation of the vicinity is of the most luxuriant description. The aloe, palm, sugar-cane, prickly pear, orange, vine, olive, indigo, and sweet potato (*Batata de Malaga*), grow here abundantly. There are here the ruins of a Moorish castle, with a small tower. The town was taken from the Moors by Ferdinand the Catholic, after a long siege. Pop. (1887), 23,425.

VELIKI-LOUKI, a t. of Great Russia in the government of Pskov, on the river Lovat, 130 m. n.w. of Smolensk. It is one of the most ancient towns of Russia, having belonged to Novgorod before the annexation of that territory to Moscow. Boots are largely manufactured, and exported to St. Petersburg. Pop. '93, 7478.

VELIKI-USTIUG, or USTIUG-VELIKI, a trading-t. of Great Russia, in the government of Vologda, at the confluence of the Jug and the Suchona, 350 m. s.e. of Archangel. It was founded in the 13th c. by a colony from Novgorod. It exports grain, leather, flax, etc., and imports manufactures and colonial wares. Pop. '93, 8513.

VELINO, CATARACT OF. See TERNI.

VELLE'IA, or VELEIA, a t. of ancient Liguria, situated among the northern slopes of the Apennines, 18 m. s. by e. of Placentia (Piacenza). Little information respecting

it can be gleaned from the Latin writers. The Veleiates are mentioned by Pliny among the Ligurian tribes, and seem to have been subjected to Rome in 158 B.C. The t., however, dates from the time of Tiberius, and appears, according to the traditionary account, to have been overwhelmed by a land-slip of the mountains Moria and Rovinazzo, the earth having been loosened by the percolation through it of the waters from a lake high up in the mountains. A comparison of the soil which covers the city with that of the mountains, confirms this story, though, strange to say, there is not the slightest notice in Roman history of such an event having happened. Velleia remained hid and forgotten till 1747, when a field-laborer turned up a tablet of bronze, on which Trajan's alimentary law for the public maintenance of 279 children was written. This tablet, which measured about 8 ft. 8 in. by 5 ft. 9. in., Paris measurement, and weighed 7,200 ounces, narrowly escaped being melted down for bell-metal; and in 1760 excavations were commenced by the directions of the duke of Parma at the place where the tablet had been found. The result of these investigations, which were continued till 1765, was the discovery of a forum, in which was another bronze tablet of a smaller size than the one previously found, an amphitheater, baths, 12 marble statues, numerous small bronze statues, medals, coins, stamps, inscriptions, and bronze instruments of various kinds. From none of the coins discovered being of later date than the time of Probus, it has been supposed that the catastrophe which overwhelmed the city happened either during or soon after his reign. The museum at Parma contains most of the antiquities which have thus been rescued from the bowels of the earth.

For about a century previous to 1747, it was known to a very few that ancient treasures were concealed at the place where the town was subsequently discovered; and so much wealth in coins and gold statues was discovered by a poor priest belonging to the adjoining village of Macinisso, that his family became ennobled.

A few trifling excavations have been made since 1765, but they have now been discontinued for a number of years.—See *La Rovina di Veleia, misurate e disegnate da Giovanni Antolini,* etc. (Milano, 1819); and *Tavola Legislativa della Gallia Cisalpina ritrovata in Veleia da D. Pietro di Lama* (Parma, 1820).

VELLE'TRI, a city of southern Italy, in the province of Rome, is walled, well built, and situated on a hill, 26 m. s.e. of Rome. The principal buildings are the cathedral, an ancient Gothic structure; and the Ginetti palace, with a marble staircase, esteemed the finest in Italy. The hill of Velletri, which, like the surface of all the county between it and Rome, exhibits evidences of volcanic action, produces good wines. Pop. about 13,000.

VELLORE, a t. and fort of British India, presidency of Madras, in the district of Arcot, 80 m. w. of Madras, on the right bank of the Palar. The fort is extensive, is surrounded by a ditch cut in solid rock, and contains barracks, hospitals, etc. The t. is large, clean, and airy, and has an extensive and well-supplied bazaar. The t. contains a most remarkable and splendid pagoda, dedicated to Krishna, whose adventures with the *gopis,* or milkmaids, are represented in a series of elaborate sculptures. Although the heat of Vellore is great, it is considered one of the healthiest stations in the Carnatic. Vellore was the residence of Tippo Sahib's family from 1799 to 1806, when they were removed on account of a sepoy mutiny, which resulted in a terrible massacre of Europeans. Pop., with cantonments, 1891, 44,925.

VELLO'ZIA, a genus of plants of the natural order *hæmodoraceæ,* natives of Brazil, southern Guiana, and the Mascarene islands. They are sometimes called *tree lilies.* They are perennials, with trunks closely covered by the withered remains of leaves, branching by forks, and bearing tufts of long, narrow, aloe-like leaves at the extremities of the branches. Some of them are from 2 to 10 ft. high, and the trunk is sometimes as thick as a man's body. The structure of the trunk is very remarkable. It has a slender sub-cylindrical central column, of the ordinary monocotyledonous structure, outside of which are arranged great quantities of slender fibrous roots, which cohere firmly by their own cellular surface and form a spurious kind of wood. In some of the southern districts of Brazil, vellozias are found covering large tracts. The flowers of the larger species are about 6 in. long, either pure white, or of a beautiful purple color, much resembling the white lily of our gardens.

VELLUM. See PARCHMENT.

VELOCI'PEDE, a vehicle, consisting of two wheels placed one before the other, and connected by a frame-work, affording a seat for the rider, by whom the vehicle is propelled by means of pedals working a crank attached to the forward wheel. The first known velocipede was invented in 1817 by M. Drais of France, propelled by striking the ground with the feet. In the more modern vehicle the equilibrium is maintained by the momentum in a certain plane, and by the motion of the rider's body and limbs. About 1867, greatly improved forms of the velocipede were introduced, and the exercise became very popular. Among the feats performed were the riding of 100 m. in 7 hours and 43 minutes by David Stanton, and of 132 m. in 12 hours and 15 minutes by J. T. Johnson. Within a few years the velocipede in its old form has given way to the bicycle and tricycle. See BICYCLE: TRICYCLE.

VELOCITY (Lat. *velox,* swift) is the common term employed to denote speed, or *rate of motion.* It is obviously greater the greater the space passed over in a given time.

But, for its accurate measurement, we must distinguish between uniform and varying velocity.

Nothing is easier than the measurement of uniform velocity. It is measured by *the space passed over in a unit of time.* Thus, we speak of velocities of 10 ft. per second, 20 m. per hour, etc. But, for scientific purposes, it is best to keep, as far as possible, to definite units of time and space; and those most generally convenient are the *second* and the *foot.* The latter is defined, from the imperial yard, by act of parliament: the former is usually chosen as the interval between the beats of a good mean-time clock. Unfortunately, its duration is not invariable; but, as ages must elapse before any sensible alteration takes place in its length, it may be used without inconvenience. If, then, v be the velocity of a point moving uniformly, we mean that v feet are passed over in each second, so that, if s represent the space passed over in t seconds, we have $s = vt$, a formula which contains the whole properties of uniform motion. It gives $v = \frac{s}{t}$; that is, to find the velocity of a moving point (when uniform), divide the space (in feet) described in *any* period of time by the number of seconds in the period. This will give the same result whether we take a million seconds or the millionth part of a second, as the period in question. This at once shows us how to proceed in measuring a variable velocity, such as that of a stone let fall, in which case the velocity constantly increases, or of a stone thrown upward, in which case the velocity constantly diminishes.

That a moving body has at every instant, however irregular its motion may be, a definite velocity, is obvious, and is in fact matter of every-day remark. Thus when traveling in a railway train we say, shortly after starting. "We are now going at the rate of a mile an hour;" not thereby meaning that it will take us an hour to complete the mile, but that *if we were to go on for an hour with the velocity we now have we should run a mile.* Again we may say: "Now we are going at 30 m. an hour;" not thereby meaning that we have so much as 30 m. to travel, or that our journey is to last more than perhaps a few minutes, but that *an hour at the present rate would take us* 30 *miles.* In common language, then, our question is how to measure our present rate.

If we could at any instant so adjust the steam-power to the resistance of the air and the friction of the rails as to keep the rate unaltered, we should have uniform velocity, measurable with ease, as above shown. But as we cannot generally do this (though Attwood's machine enables us to do it in the case of a falling body), we are driven to some other expedient. Now it is obvious that the smaller the interval we take the less will our velocity have changed during its lapse, i.e., the more nearly will it have become uniform and measurable by the simple formula given above. That is for a variable velocity we have $v = \frac{t}{s}$ as an approximation, which is more and more nearly true as t, and therefore s, is smaller. In the language of the differential calculus—whose fundamental notions as laid down by its great inventor were in fact derived from this very question, the velocity being simply the *fluxion* (q.v.) of the space described—we have $v = \frac{ds}{dt}$. Practically, by means of the electric chronoscope, we can now measure (very exactly) extremely small intervals of time, such, for instance, as the interval between the fall of the dog-head and the exit of the bullet from a rifle-barrel; so that a variable velocity now presents no formidable difficulty, as we can study and measure it *while it is almost absolutely uniform.*

We define *average* velocity as the space described in any time divided by the number of seconds employed. This may not, except at one or more instants during the motion, represent the actual velocity; but it is a velocity with which, if uniform, the same space would have been described in the same time. We shall presently have an opportunity of usefully applying this definition to one interesting case of varying velocity.

The *resolution* and *composition* of simultaneous velocities follow, almost intuitively, from the most elementary geometrical notions. When a man is walking n.e. at a uniform rate, it is obvious to common sense that he is progressing northward and also eastward. What is his northward, and what is his eastward velocity. The answer is very simple. Suppose that in one second he walks from A to B, then AB represents his whole velocity. But draw AN northward and AE eastward; also draw BC parallel to AN. Then AC is the space by which B is eastward of A, BC the space by which it is northward. Hence AC represents the eastward and CB the northward velocity (each being the space in its respective direction described in one second), and these are called *components* of the velocity AB. AB again is said to be *resolved* into AC and CB.

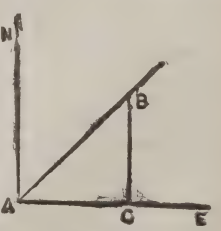


FIG. 1.

The general proposition is this, that a velocity represented by one side of a triangle may be resolved into two, represented in magnitude and direction by the other sides of the triangle. One or both of these may be again resolved by a similar process; and we find, as the most general propositions on the subject, that velocities represented by all the sides of a polygon (whether in one plane or not)

but one, taken in the same order round, are jointly equivalent to a velocity represented by that one side, taken in the *opposite* order, also that a point which has simultaneously velocities represented by the successive sides of any polygon, taken all in the same order round, *is at rest*. The second law of motion (see MOTION, LAWS OF) enables us to interpret this geometrical theorem into the physical truths known as the triangle and polygon of forces in statics.

Rate of change of velocity is called *acceleration*. It is measured in the same way as velocity itself. Thus if the change take place in the direction of motion it affects merely the amount, not the direction of the velocity; and an acceleration α adds (or subtracts, if it be negative) α feet per second from the velocity affected. Thus it is found that gravity produces an acceleration of about 32.2 on all falling bodies; so that if a stone be let fall, its velocity after t seconds is $32.2t$. If it be *thrown* down with a velocity v, its velocity in t seconds is $v + 32.2t$. If thrown upward with the same velocity, in t seconds its velocity becomes $v - 32.2t$, so that it will stop and begin to descend after $\frac{v}{32.2}$ seconds have elapsed.

The space passed over by the stone in t seconds is easily calculated by the help of the *average* velocity. For since in any of the above cases the velocity increases (or diminishes) *uniformly*, its average value during any interval is the average of its values at the beginning and end of the interval. Hence for the stone simply let fall:

Initial velocity $= 0$,

Velocity after t seconds $= 32.2t$,

Average velocity during the first t seconds $= 16.1t$. Hence, space described in t seconds

$= t \times$ average velocity $= 16.1t^2$.

So that the spaces described are as the *squares* of the times.

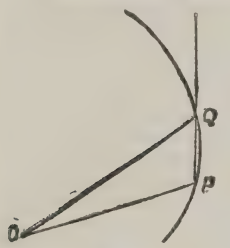


FIG. 2.

But if the acceleration be not in the direction of motion, the direction and magnitude of the velocity will generally change. To exhibit this geometrically, sir W. Rowan Hamilton (q.v.) invented the following beautiful construction of what he called the hodograph of the motion. Let O be any fixed point, and from it draw lines OP, OQ, etc., representing at every instant in direction and magnitude the velocity of the moving point. The extremities of such lines will form a curve, such as PQ in the figure. If OP and OQ be any two of these, the *change* of velocity is represented (as above) by the third side, PQ, of the triangle. As Q is taken nearer and nearer to P, PQ becomes more and more nearly the tangent to the hodograph, so that the tangent at P has the *direction* of the acceleration, and the rate at which P moves round the hodograph is the *magnitude* of the acceleration.

If we consider any uniform motion, we see that the hodograph is a circle (its radius being the magnitude of the velocity), and from this it is easy to see that *in uniform motion the acceleration is always perpendicular to the direction of motion*. If we consider uniform motion, with velocity V, in a circle of radius R, the hodograph at once shows that the acceleration is $\frac{V^2}{R}$, and is directed toward the center of the circle.

Translated into physics, acceleration (multiplied by the mass of the moving body) is the measure of the force which acts on the body. So the above simple example shows that, to keep a mass moving uniformly in a circle, it must be drawn toward the center by a force proportional directly to the square of the velocity, and inversely to the radius. This is the physical explanation of the so-called centrifugal force (see CENTRAL FORCES).

VELOCITY, INITIAL, in gunnery, is the speed with which the ball leaves the muzzle of the gun. This was formerly calculated from the momentum as shown by the ballistic pendulum (q.v.). A great improvement of the last ten years is the electro-ballistic pendulum, the invention of a Maj. Navez of the Belgian service, which actually measures the interval of time during which the shot traverses a short space of ground. The apparatus consists of a steel pendulum falling at the side of a graduated sector of a circle. Behind the segment is a piece of iron capable of being magnetized by a galvanic battery adjoining. The wires for completing the circuit between the battery and the magnet are so arranged that they are in connection with two targets of paper or other thin material in the line of the projectile's fire. So long as the circuit is complete, and before the experiment, the magnet holds the pendulum at its highest point. When the shot pierces the first target, the circuit is broken, the iron demagnetized, and the pendulum released; these effects being absolutely simultaneous. With equal simultaneity, the piercing the second target re-establishes the circuit, magnetizes the iron, and arrests the pendulum in its descent. The distance between the targets is known, and the accumulating resistance of the atmosphere within that time; the sector being finely graduated, the distance traversed by the pendulum shows exactly the fraction of a second occupied, and from these data the initial velocity is a matter of simple computation. Of an ordinary smooth-bore cannon the initial velocity is about 1600 ft. per second.

VELOCITY, Virtual. See Work.

VELPEAU, Alfred Armand Louis Marie, 1795–1867; b. France; studied medicine, and settled in Paris in 1821. In 1830 he was appointed surgeon to the Pitié hospital; in 1835 professor of clinical medicine at the academy of medicine, and in 1842 was called to the same position at the institute. Among his works are: *Traité de l'Anatomie Chirurgicale* (1825); and *Nouveaux Eléménts de Médicine Opératoire* (1832).

VEL'VET, a fabric in which, besides the ordinary warp and weft, which are usually arranged as in twill-weaving, there is also a supplementary weft, consisting of short pieces of silk, cotton, or woolen thread doubled under the regular weft, and brought to the surface in loops which are so close together as to conceal the regular web. The loops are afterward cut evenly, and the ends thus made constitute a covering resembling a very short fur. In silk velvets, the warp and pile threads are both of organzine silk, which is the strongest used in weaving.

VELVETEEN. A cotton fabric whose pile is so cut that it resembles velvet, though less beautiful in texture and less retentive of color. When it has a twilled back, it is often called Genoa. It is of English origin. It was introduced into France in 1740, but was not produced there to good advantage until 1768. Large quantities are now manufactured at Lyons, France, and at Crefeld, Prussia.

VENANGO, a co. in n.w. Pennsylvania, drained by the Alleghany and French rivers; 655 sq.m.; pop. '90, 46,640, chiefly of American birth, with colored. Co. seat, Franklin.

VENDACE, *Coregonus Willughbii* or *marœnula:* see Coregonus, a fish of the family *salmonidæ,* found in the rivers and lakes of Sweden, in the castle loch at Lochmaben in Scotland, and in some of the English lakes. It is popularly said to have been introduced at Lochmaben by queen Mary; but the statement rests on no authority, and is highly improbable, as the fish could not be easily transported, except by the roe, living only for a very short time after being taken out of the water. Like most of its congeners, it is highly esteemed for the table. Its food consists chiefly of *entomostraca,* and it is never taken by angling. Sweep-nets are used for its capture. It generally swims in considerable shoals, often with a remarkable separation of the sexes. It attains a length of 6 or 7 in., is deeper in proportion than many of the salmonidæ, and of a compressed form. The outline rises quickly from the snout to the dorsal fin, and the body tapers rather suddenly at the tail. The under-jaw projects a little. The scales are of moderate size, and do not come off very readily. The tail is broadly forked. The back is brown, the sides tinged with yellow, the cheeks partly white, and there is a curious red, heart-shaped mark between the eyes.

VENDEE, La, a maritime department in the west of France, bounded on the w. by the bay of Biscay, on the n. by the department of Loire-Inférieure, and on the s. by that of Charente-Inférieure. Area, 2,588 sq.m.; pop. '96, 441,735. The department, which owes its name to a small affluent of the Charente, is traversed from e. to w. by a range of hills, called in the e. the Plateau de Gatin, and in the w. the Collines Nantaises; and is watered in the n. by the affluents of the Loire, and in the s. by the Lay and the affluents of the Charente. The territory of La Vendée is divided into three parts, the names of which indicate the character of their configuration. In the w. is the *Marais,* occupied by salt marshes and lakes; in the n. is the *Bocage,* covered with plantations; in the s. and middle is the *Plaine,* an open and fertile tract. The coast-line, 93 m. in length, presents few deep indentations, the chief being the bay of Aiguillon, which affords secure anchorage for vessels. The climate is warm, humid, and unhealthy in the *Marais,* cold and humid in the *Bocage,* and warm, dry, and healthy in the *Plaine.* Cereals, potatoes, flax, hemp, honey, hops, fruit, and vegetables are largely cultivated, and much wine is produced. Among the mineral treasures iron ore and coal are very abundant. There are three arrondissements — La Roche-sur-Yon, Fontenay-le-Comte, and Sables-d'Olonne. The capital is La Roche-sur-Yon. For the *wars of La Vendée* (by which name the armed opposition to the religious and political changes in France is denoted, and which burst out into a species of partisan warfare in 1793, 1794, 1795, 1799, and 1815), see Cathelineau, Larochejacquelein, Hoche, Chouans, etc.

VENDÉMIAIRE (i.e., the "wine-month"), embraced, in the calendar of the first French republic, the period from Sept. 23, to Oct. 21. Particularly memorable in the history of the revolution is the 13th Vendémiaire of the year IV. (Oct. 5, 1795), when the Paris "sections" worked upon by royalist reactionaries in all sorts of ways, rose against the national convention, but were decisively beaten by a military force under the command of Barras, or rather of his lieut., Napoleon Bonaparte, then a young officer only beginning to be known. The victory of the convention saved the republic—for a time.

VENDET'TA, (vengeance), the term used to denote the practice, as it prevails in Corsica, of individuals taking private vengeance upon those who have shed the blood of their relations. In Corsica, when a murder has been committed, the murderer is pursued not only by the officers of justice whose duty it is to punish offenses against society, but also by the relatives of the slain, upon whom the received views of social duty impose the obligation of personally revenging his death. In such a case, the relatives

of the murdered man take up their arms, and hasten to pursue, and if they can find him, to slay the murderer. If he succeed in eluding their pursuit, the murder may be revenged upon his relatives; and as the vengeance may be taken whenever an opportunity occurs, the relatives of a murderer whose crime is unavenged have to live in a state of incessant precaution. When they go to the fields they take their arms with them, and set a watch; at home they have their doors well fastened, and their windows barricaded; and since the avenger is never far distant, they live, in fact, in a state of siege. Instances are on record of persons who were, as the phrase is, "suffering the vendetta," having lived shut up in their houses for 10 or 15 years, and being, after all, shot on the first occasion on which they ventured out of doors. Formerly, when blood had been shed, there was a custom of proclaiming the war of revenge, and announcing to what degree of relationship it should extend; but this custom is gone out of use. Frequently, in the practice of this system of vengeance, each of two sets of relatives has a murder to revenge upon the other; the vendetta, that is, crosses. This is called the *vendetta transversale*. The duty of taking vengeance lies primarily and especially upon the next of kin. Not to take revenge is deemed in the highest degree dishonorable; and any delay in doing so on the part of the next of kin is made matter of reproach by his relatives. When the Genoese were masters of the island, their laws declared the *rimbicco*—the uttering of such reproaches—punishable, as an incitement to murder. But there is seldom occasion for the rimbicco, for the Corsican is brought up to regard the vendetta as the most sacred duty of man. The women instigate the men to revenge by singing songs of vengeance over the body of the slain, and displaying his blood-stained garments. Often a mother affixes to her son's dress a bloody shred from the dead man's shirt, that he may have a constant reminder of the duty of taking vengeance. Although the vendetta usually has its origin in bloodshed, smaller injuries may give rise to it, and even purely casual occurrences. Mediators, termed *parolanti*, often interpose to make up a quarrel. When they succeed, an oath of reconcilement is taken, and this oath is regarded as specially binding. It is infamous to break it; nevertheless, it is broken now and then. Brigandage prevails to a great extent in Corsica, and the origin of the career of a brigand, in almost every instance, can be traced to the vendetta. A man commits a murder out of vengeance; he flees to the hills; it never is safe for him to resume his former life again, and so he turns robber for a living. Besides the vendetta, properly so called, hereditary family feuds are very common in Corsica; and sometimes there are hereditary feuds between whole villages. The great families of the island hand down feuds from generation to generation, in which not only themselves and all their relatives, but all their servants and dependents are involved—the kind of feud which was common in the Italian towns of the middle ages, and which is illustrated in the play of *Romeo and Juliet*.

The origin of the vendetta has often been referred to the lawlessness which prevailed in many parts of Corsica during the period of the Genoese domination, and to the venality which vitiated the Genoese administration of justice. And, no doubt, the insecurity and the mal-administration of justice which existed in Corsica for ages, helped to consolidate this barbarous custom; which, thus consolidated, has been perpetuated by the isolated position of the country, and the absence of civilizing influences. But the explanation of its origin must be sought in more general causes, for it is not exclusively a Corsican custom. On the contrary, it may be safely affirmed that a system of private vengeance, almost precisely similar, has existed among every people during certain stages of its progress—never entirely passing away until government became strong enough to insure redress of injuries, and to restrain the passions of individuals.

In the case of rude tribes, in the savage or semi-savage state, there is on record such a multitude of instances of the existence of the blood-feud, that its universality among men in that state cannot be doubted. Its incidents are usually the same which sir G. Grey found subsisting among the aborigines of Australia, and of which, in his *Journals of Travel in the North-west of Australia*, he has given a vivid description. The Australian tribe usually includes several stocks or bodies of men, between whom blood-relationship is acknowledged; and every member of a stock is bound to assist in taking vengeance for a personal injury done to any of his kinsmen. On the other hand, though a hunt is always made for the actual wrong-doer, the injury may be satisfactorily avenged upon any member of his stock. As in the Australian and similar tribes, there is no relationship acknowledged between members of the same family unless they are also members of the same stock (see article TRIBE), the blood-feud occasionally arrays father against son, and brother against brother. It often leads to the break-up of a tribe.

Of the prevalence of the blood-feud among tribes which have advanced to what is called the patriarchal state also, there is very ample evidence. Among such tribes, the cohesion of the family is very powerful; everything relating to the family is quasi-sacred; and the duty of taking vengeance for kindred blood is not merely a matter of honor, but of religion. Volney's description of the blood-feud, as practiced among the Bedouins, will do for all the tribes of this class; and it might almost stand for a description of the vendetta. "The interest of the common safety," he says, "has for ages established a law among them (the Bedouins) which decrees that the blood of every man who is slain must be avenged by that of his murderer. This vengeance is called *tar*, or

retaliation; and the right of exacting it devolves upon the nearest of kin to the deceased. So nice are the Arabs upon this point of honor, that if any one neglects to seek his retaliation, he is disgraced forever. He therefore watches every opportunity of revenge; if his enemy perishes from any other cause, still he is not satisfied. His vengeance is directed against the nearest relation. These animosities are transmitted as an inheritance from father to children, and never cease but by the extinction of one of the families, unless they agree to sacrifice the criminal, or purchase the blood for a stated price in money or in flocks. Without this satisfaction, there is neither peace, nor truce, nor alliance between them, nor sometimes even between whole tribes." The blood-feud is observed almost precisely as described above, among the Circassians, the Druses, and the numerous hordes of central Asia; it seems to have had the same incidents, too, among similar tribes in ancient times—e.g., among the Greeks of the Homeric period, among the Germans in the time of Tacitus, among the northern nations who overran Europe after the fall of the Roman empire. The Corsican vendetta seems to be the same thing as the Bedouin tar, surviving, with slight modifications, in a secluded island, where the law has never made itself supreme, long ages after the progress of society and the consolidation of government have effaced every trace of it, except at a few isolated points on the neighboring continent of Europe. The vendetta exists in Sicily and in Sardinia, as well as in Corsica; in Calabria also; and it (or we should rather say, the blood-feud) flourishes vigorously among the Montenegrins and the Albanians.

The right of private war which subsisted in Europe in the Middle Ages—introduced by the northern nations who shared the spoils of the Roman empire—was just a modification of the blood-feud. This right belonged only to the nobility, and could be exercised only against men of equal rank. It was usually resorted to on account of insults publicly done, of atrocious acts of violence or bloodshed, and similar injuries. The right of vengeance devolved first upon the next of kin; but all the kindred within the degrees of relationship to which the ecclesiastical prohibitions of marriage extended, were bound to take up the quarrel; and this obligation was so far sanctioned by law, that if any one failed to fulfill it, he was deemed to have renounced his kindredship, and to have lost his rights of succession. Vassals, equally with kinsmen, became implicated in the vengeance of their lords; and every person present when the cause of quarrel arose was required to take side with one or other of the parties. For several centuries, private wars were constantly being waged within the kingdoms of the continent, and the efforts of kings and ecclesiastics to restrain them produced little effect until governments became strong enough to prohibit them, and to enforce the prohibition.

It is now apparent that the vendetta represents a system which prevailed everywhere before the consolidation of society into the state, and the establishment of a police capable of protecting life and property. This system was a rude substitute for government and the administration of justice. The family, or the body of kindred, formed, in fact, a commonwealth of itself; its members held firmly together; and when one was injured, all the little state was injured. The Nagas have no government, and among them the blood-feud is the only check—it is not altogether inefficient—upon the selfishness and the passions of individuals. As society became consolidated, the exercise of this right of vengeance was curtailed—remaining longest with the nobility, who counted it as one of their most valuable privileges, and maintained it as long as possible. They had to surrender it at last, because the state grew strong enough to supersede the action of individuals in redressing injuries, and was able to do this with greater fairness, and without the same admixture of calamitous results. See Maffia and Mala Vita.

VENDÔME, a t. of France in the dep. of Loir-et-Cher, seated on vine-clad hills, on the Loir, which here divides itself into many canals, 20 m. n.w. of Blois. It contains cavalry barracks, a lyceum, a library, a theater; the church of the Trinity, a remarkable edifice; a college; and the ruins of a lofty castle. Manufactures of leather, cotton goods, gloves, and paper are actively carried on. Pop. '91, 9538.

VENDÔME, a very ancient town, and said to have been of importance under the Merovingians, was the capital of the ancient county of Vendomois, which was erected into a duchy-peerage by Francis I., in favor of Charles de Bourbon. Henry IV. conferred it on one of his natural sons, who thus became the founder of the house of Vendôme. In 1870, it was the scene of several conflicts between the French and Germans.

VENDÔME, House of. Vendôme was an old county of France, erected into a duchy by Francis I., for behoof of Charles of Bourbon, the grandfather of Henry IV. On the accession of the Bourbons to the throne, it was reunited to the crown, but again separated from it by Henry IV., who conferred it upon Cesar, the eldest of his sons by Gabrielle d'Estrées. Cesar's eldest son, Louis, duke of Vendôme, married Laura Mancini,* one of Mazarin's nieces, and had by her three sons, the eldest of whom was Louis-Joseph, Duke of Vendôme, the celebrated French general who so distinguished himself

* It is curious to remark the relationship between the opposing leaders in the great war of 1700–13. Vendôme (French) and prince Eugene (allied) were cousins; Vendôme was second cousin to the duke of Burgundy; Eugene was similarly related to the duke of Savoy; and Marlborough (allied) and Berwick (French) were uncle and nephew.

during the war of the Spanish succession. He was born at Paris, July 1, 1654, and made his first appearance on the field of battle as a lifeguardsman during the Dutch campaign of 1672, afterward serving with distinction under Turenne in Germany and Alsace, and under Crequi in Flanders. Released by the peace of Nimeguen (1678), he retired to his château of Anet, near Dreux, where he resigned himself to the most liberal indulgence in all kinds of pleasure. At this time he became compromised in the affair of Lavoisin (see Poisoning); but it turned out that his intercourse with the pretended seer was prompted merely by curiosity. On the outbreak of war in 1688, he was ordered to the low countries, where, under Luxembourg (q.v.), he earned deserved renown at the sieges of Mons and Namur, and the battles of Leuse and Steenkerk; and his high reputation was not diminished by his subsequent conduct in Italy, where he commanded the left wing of Catinat's army at the battle of Marsaglia (Oct. 4, 1693). But Vendôme's brilliant gallantry and military talents had not hitherto succeeded in obtaining for him the honor of an independent command, for it was only too evident that with these valuable qualities were combined inveterate indolence, and careless and disorderly habits, which might, as effectually as the most utter incapacity, ruin the chances of any enterprise under his management. However, the necessities of the case induced Louis ultimately to give him (1695) the command of the army in Catalonia; and he was agreeably surprised at the alertness of Vendôme, who closed a series of brilliant successes by the capture of Barcelona, an exploit which did much to bring about the peace of Ryswick (1697). After five years of inaction, spent in sloth and sensuality, he was dispatched by his sovereign to supersede Villeroy in Italy. His arrival was hailed enthusiastically by the soldiery, who relied implicitly upon his brilliant genius and happy audacity to extricate them from all difficulties, and with whom his excessive laxity in the matter of discipline rendered him a great favorite. The restored confidence of the troops was proved by the victories of Ustiano and San-Vittoria; while the enforced retirement of prince Eugene beyond the Mincio equally showed the superior strategic abilities of their general; and it required the utmost exercise of both to prevent the surprise at Luzzara (Aug. 15, 1702), brought about through Vendôme's usual carelessness, from becoming a total rout. From this time, a slight though temporary improvement in Vendôme's habits is visible; in 1703, he drove the Austrians before him into the Tyrol, repeatedly defeating Starhemberg; when the defection of the duke of Savoy forced him to retreat. The duke, though joined by Starhemberg, was beaten again and again, and at last cooped up in Turin, whither Eugene was advancing to his relief, when the defeat of his advanced guard by Vendôme compelled a halt. The imprudent Frenchman, however, intrusted the difficult duty of holding Eugene in check to his younger brother, the grand-prior, who, though a gallant soldier, was no match for his opponent in generalship; and had not Vendôme returned to Cassano just in time to divide the honors of the battlefield with his opponent, the army of observation would have been scattered to the four winds of heaven. Again, partially stimulated by this narrow escape, Vendôme displayed unwonted vigor, and drove the Austrians into the Trentin; but in the summer of 1706, he was recalled to supersede Villeroy, who had blundered in the low countries, as he had formerly done in Italy. Unfortunately, Vendôme's besetting faults were attempted to be remedied by uniting the duke of Burgundy with him in command; and the want of a thorough understanding between the conjoint chiefs led to the defeat of the French at Oudenarde (q.v.), and to the failure of the attempt to relieve Lille. The cause of these reverses formed the subject of vehement discussions in France, and though undoubtedly Vendôme was mostly to blame, his great reputation gained him the public support; yet Louis XIV. held him in a sort of disgrace for a time. In 1710, a cry of distress arose from Spain, where the British and Austrians were carrying all before them; and in compliance with the urgent request of Philip V. (who had served under Vendôme in Italy) to his grandfather to send him—not a re-enforcement, but only Vendôme, the heroic old debauchee was once more roused up from his lair, and dispatched to Spain. His appearance, like that of Du Guesclin more than three centuries before, brought together as if by magic a numerous army of volunteers; towns, villages, and even religious establishments united in a most enthusiastic manner to contribute the necessary funds, and Philip was settled in his capital before the close of the year. A week after, Stanhope and the British troops were defeated and captured at Brihuega; and on the following day, Starhemberg and the Austrians were completely routed at Villa Viciosa. The grateful monarch raised his deliverer to the rank of a prince of the blood-royal, and presented him with 500,000 livres (£20,000), a gift which Vendôme accepted only to distribute it among his soldiers. Vendôme for the last time relapsed into his usual habits, and after "a month of extraordinary gluttony," died of indigestion at Vinaroz in Valencia, June 15, 1712. Vendôme, of all the descendants of Henry IV. both then and since, bears the strongest resemblance to his great-grandfather; but of the resolute persistency and self-denial of the first and greatest of the Bourbon monarchs, we cannot discern in him the slightest trace.—Saint-Simon's biography of Vendôme, and Voltaire's *Siècle de Louis XIV.*, are the principal authorities for the life of this extraordinary man.

Vendôme's disinterestedness, like his other good qualities, and they were not a few, became a vice from its very extravagance. It is related that one of his domestics demanded permission to leave his service on the ground that he could not stand by to

see a master robbed by his servants in such a barefaced way. "Is that the reason?" said Vendôme; "very well, then, rob like the others."

VENDOR'S LIEN, the equitable lien which the vendor of land has for the balance of the purchase money still unpaid. It is enforced, like a mortgage, which it resembles, by foreclosure and sale. It can be enforced against the vendee, and all persons holding under him, except purchasers for value without notice. The vendor loses this lien if he accept a higher security, a mortgage, for instance, or if he take collateral security from a third person; but he does not waive his lien by accepting the personal security of the vendee.

VENEER (Fr. *fournir*, to furnish), a layer of wood, cut very thin, for the purpose of being glued on to the surface of a commoner kind. Only choice kinds of hard woods are sawn into veneers, and they are usually attached to deal or pine, so as to give all the appearance of being made solid. In this way the more costly kinds of furniture-woods are economically used by the cabinetmaker, for with the improvements which have been effected in the process of sawing, veneers as thin as paper have been produced.

VENEREAL DISEASE. See Syphilis.

VENERIDÆ, a family of lamellibranchiate mollusks, having a regular, closed, bivalve shell; the teeth and laminæ of the hinge near together in a single group under the beak (*umbo*); generally three diverging teeth in each valve; a marked oval impression in front of the beak; the general form similar to that of the cockles (*cardiaceæ*), but usually more flattened. The mantle has a large opening in front; the siphons are unequal, more or less united; the foot is tongue-shaped, compressed, sometimes grooved, and producing a byssus (q.v.). The species, all of which belong to the Linnæan genus *Venus*, are very numerous. They are very widely distributed, but abound chiefly in tropical seas. About forty are found on the British coasts, some of them very common. The veneridæ are generally elegant in form, and often finely colored. Some of them have the shell furnished with long spines, but chevron-shaped lines are their common ornament. The veneridæ first appear in the oolitic rocks, and are more abundant in the present than in any former geological epoch.

VENESECTION (occasionally termed Phlebotomy, and popularly known as Bloodletting or Bleeding) is an incision into a vein, for the abstraction of blood. Although the operation may be performed on many of the superficial veins, it is restricted in this country to the veins at the bend of the elbow. Of these veins, the most prominent are the median-cephalic and the median-basilic; the former being situated on the outer side of the tendon of the biceps muscle, while the latter lies on the inner side, and only separated from the brachial artery by a thin layer of fascia. Hence, from fear of wounding the artery, the median-cephalic should be preferred; but in reality the median-basilic is usually selected, in consequence of its being the more prominent and larger vein of the two. The appliances required are a lancet, a bleeding-tape or narrow bandage; lint, a bowl to receive the blood, a basin of water, and a sponge. The patient being placed in a sitting position, the tape or bandage must be tied sufficiently tight around the middle of the upper arm, or rather lower, to arrest the venous circulation without materially affecting the pulse at the wrist. The forearm having been allowed to hang down till the veins are tense, the operator must make his selection, and taking the blade of the lancet between the forefinger and thumb of the right hand, should fix the vein by pressing his left thumb upon it just below the part he is about to open. Steadying his hand by resting the ends of the three outer fingers on the forearm, he should steadily (and without a jerk or plunge) introduce the point of the lancet obliquely until the interior of the vessel is reached, and the blood is seen rising up. Without penetrating deeper, he should thrust the instrument forward, so as to open the vein longitudinally to a sufficient extent. On now removing the thumb, the blood should emerge in a full jet; and if the stream be scanty, the patient may have a hard body—as a piece of stick or a pocket-knife—placed in his hand, with directions to grasp it firmly, or the surgeon may increase the flow by chafing the palmar surface of the forearm, rubbing from below upward. When a sufficient quantity of blood has been abstracted, the thumb of the left hand should be placed on the wound, and the ligament loosened; a small pad of lint should then be placed over the orifice, the surrounding parts should be cleaned of blood by a sponge, and the pad of lint compressed against the arm by the tape or narrow bandage, applied in the figure-of-eight form, with the crossing of the tape lying on the pad. After the operation the arm should be carried in a sling for a day or two. We have, contrary to our ordinary custom, given the details of the operation, because it is one which, if performed at the proper moment, may be the means of preserving life, and which any person of ordinary intelligence could probably perform more safely, after reading these directions, than the farriers, barbers, etc., who are frequently called upon to perform it in remote country districts and in the backwoods of our colonies. Among the occasional ill consequences of venesection may be mentioned: (1) The escape of blood into the surrounding cellular (or connective) tissue, giving rise to a swelling called *Thrombus*, which, if it does not rapidly become absorbed, should be emptied by the lancet. This is due to a want of coincidence between the wound in the integument and in the coats of the vein. (2) Phlebitis, which generally arises from the use of an unclean

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80
70
60
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40
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Falkland Sd.
Str. of Magellan
TIERRA DEL FUEGO
Cape Horn
Port Sta. Cruz
Port Gallegos
C. Virgins
Port S. Julian
Port Desire
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C. Three Points
G. of St. George
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lancet. (3) Varicose aneurism and (4) aneurismal varix, both of which may be included under the term arterio-venous aneurism, since in each case there is an aneurismal dilatation of an artery communicating with a vein; while they differ in this respect, that varicose aneurism is said to exist when an artery has been punctured through a vein (in this case, the brachial artery through the median-basilic vein), and a false or traumatic aneurism, composed of lymph that was effused between the vessels, has formed between them, and opens into both; while aneurismal varix is similarly produced, but the two vessels adhere together, the communication between them remaining permanent. These diseases often have such a tendency to remain stationary that no interference is necessary; occasionally, however, very serious surgical treatment is required.

In children, and occasionally in others, where the veins of the arm are small and undefined, blood is drawn from the external jugular veins. As this operation would only be performed by a surgeon, it is unnecessary to describe it; and we will merely remark, that as the entrance of air into the vein during the operation, or until the orifice of the vein has been closed, would cause instant death, this vein should only be opened in extreme cases. We have no space to notice at any length the general results of bleeding, or the much disputed question, whether venesection should not be discarded from our list of operations, because no rational doubt can be entertained that, although, until a quarter of a century ago, or later, there was a most unnecessary and probably hurtful effusion of blood, venesection, in properly selected cases, is one of the most valuable remedies.

VENETIAN STYLE of architecture. This term is applied to the particular phase of the renaissance developed in Venice. Under the head ITALIAN ARCHITECTURE, the peculiarities of the various schools of Italian architecture are pointed out. The Venetian is the most picturesque and ornate, as compared with the styles of Rome and Florence. "Venetian-Gothic" indicates the peculiar phase of that style so common in Venice and the north of Italy, and chiefly applied to domestic architecture. See GOTHIC ARCHITECTURE.

VENEZUE'LA, a republic in the n.w. of South America, bounded on the n. by the Caribbean sea, on the w. by the United States of Colombia (New Granada), on the s. by Brazil, and on the e. by British Guiana. The country has been variously subdivided, but in 1881 it was formed into 8 states, a federal district, 2 national settlements, and 8 territories. The area is estimated at 593,943 sq. m., with a population, according to the census of 1891, of 2,323,527. This area, however, is based on the official estimates of the Venezuelan government, and includes the territory which has been claimed by Great Britain, and for many years has been a cause of dispute between the two countries. The British claims applied to the territories of Delta and Yuruari, including about one-third of the former and over half of the latter. The prevailing element in the population consists of the descendants of Spaniards, but they have mingled with the natives, and are largely of Indian blood. The Indians, in 1890, numbered about 326,000, of whom the majority are civilized, and 66,000 are independent. The capital is Caracas, with a population in 1891 of 72,429. Other important cities are Valencia, Maracaibo, and Barquisimeto. The coastline, extending from e. to w.—from the delta of the Orinoco to the boundary of the United States of Colombia—is 1584 m. in length. The most easterly part of the coast-line, 150 m. in length, and formed mostly by the delta, is washed by the Atlantic, and is very low. The waters of the gulf of Paria beat upon bold and rocky shores. The remainder of the coast-line, including the north shore of the peninsula of Paria, is washed by the Caribbean sea, and the coast, for the most part low and marshy, is sometimes precipitous, the mountains rising like a wall from the water's edge. With trifling exceptions, the country is abundantly watered. Its great river is the Orinoco, which drains by far the greatest part of it, and the course of which is almost wholly within its boundaries. The other greater rivers of Venezuela are affluents of the Orinoco (q.v.). Numerous streams, small in comparison with the great rivers, flow n. into the Caribbean sea and the lake of Maracaybo (q.v.), which is by far the largest lake in the country. The Andes enter Venezuela from the w., and divide into two branches, the first of which runs n. toward the coast, under the names of the Sierra de Perija and the Montes de Oca, but rise no higher than 4200 ft.; while the other branch, running in a n.e. direction, terminates near the coast, in long. 68° 30′ w., and attains a much greater elevation. That part of the n.e. branch of the Andes called the Sierra Nevada de Merida, and situated about 100 m. s. of lake Maracaybo, contains the only mountain that rises above the line of perpetual snow, and the two peaks of which are 15,342 and 15,310 ft. high respectively, the loftiest in the country. South and s.e. of the Orinoco are the most mountainous districts of Venezuela. They form a vast, confused, and mostly unexplored region, but none of these mountains rise to the height of the main peaks of the Andes. The country embraces vast table-lands, known under the names of *llanos*, *paramos*, *mesas*, and *punos*. There are extensive low, marshy tracts along the coasts and the lake and river banks, which, however, are abundantly fertile during the dry season. For the most part, the soil of the country is fertile. In the mountainous district in the s.e. there are great tracts well suited for the production of grain. The warmest tracts are the palm-lands; and the sago-palm, cocoa-palm, and others, grow here to a most colossal size, and yield most valuable products. Among the forest trees are the mahogany, satin-wood, rosewood, black and white ebony, and caoutchouc; and there are forests of the cinchona or Peruvian-bark tree. The cocoa and coffee trees, sugar-cane, indigo, and cotton plants are cultivated. Vegetables in great variety are

raised, and tobacco is a profitable crop. Among the wild animals are the puma, ounce, and wild-cat; the jaguar is now becoming rare. The alligator, crocodile, boa-constrictor, and rattlesnake are found. The inhabitants are made up of whites of Spanish extraction; Indians, who are docile and industrious, and are the miners, agriculturists, and manufacturers of the country; some negroes and mixed races. Agriculture is the chief occupation of the people, and the chief products raised are sugar-cane, cocoa, coffee, cereals, etc., in the more temperate parts of the country, and caoutchouc, copaiba, vanilla and tonca beans, and other tropical products in the hot districts. Cattle are also raised in large numbers, finding good pasturage in the great llanos. Sheep, goats, swine, horses, mules, and asses are also reared. The mineral wealth of Venezuela is considerable. Gold occurs in several parts of the country, but chiefly in the Yuruari territory. Silver, copper, and tin are also found, and a considerable revenue is derived from the salt mines under government administration. In 1891 hardly more than a quarter of the land was in private hands. All the rest being without lawful owners was considered public, and managed by the government. The chief trade of the country is with Great Britain, the United States, West Indies, France, Germany, and Colombia. The exports consist chiefly of coffee, cocoa, hides and skins, caoutchouc, timber and cocoanuts, and the imports of coal, manufactured goods, and hardware. There has also been, since the opening up of the mines in the Yuruari territory, a considerable exportation of gold. Internal trade is hindered by the lack of railway communications, but since 1883 there has been considerable improvement in this respect. In 1895 there were only 406 miles of railway open for traffic, but in 1896 and 1897 great activity was shown in railway construction, and the mileage was considerably increased. The monetary unit is the silver bolivar, which is divided into one hundred parts or centesimos, and is equivalent to about 20 cents in United States currency, but while gold must be accepted in any quantity in the payment of debts the acceptance of silver is compulsory only to certain limited amounts. The religion of the country is Roman Catholic, but other forms of faith are tolerated. By the law of 1870 education was made free and compulsory. The form of government is republican, modeled on that of the United States.

History.—The e. coast of Venezuela was discovered by Columbus in 1498; Ojeda and Vespucci followed in 1499, and entering lake Maracaybo, they found an Indian village constructed on piles, to prevent the evil effects of inundation, and they named the place Venezuela, or Little Venice, a name which afterward spread to the whole country. The first settlement was made at Cumana in 1520, by the Spaniards; and Venezuela remained subject to Spain till it claimed independence in 1811. It then returned to allegiance to Spain, but again revolted in 1813, and, forming with New Granada and Ecuador the Republic of Colombia, was declared independent in 1819. In 1830 the states separated. See Colombia. The history of Venezuela has been turbulent; frequent resolutions have disturbed the peace, and presidents have often assumed dictatorial power. During Crespo's presidency the country enjoyed several years of peace, although for a time the boundary dispute with Great Britain threatened to have serious results. This dispute originated in the early part of the century. Great Britain, on acquiring Guiana from the Dutch, became heir to the Dutch claims, to the disputed lands in Delta and Yuruari. The Venezuelans on the other hand succeeded to the territorial claims of Spain when they secured their independence in 1821. After long disputes an attempt was made to compromise on the Schomburgk line in 1841, but Venezuela refused. In 1844, the British offer to accept the mouth of the Maroco river as the dividing point on the coast was declined, and an agreement, entered into in 1850, that the territory could not be occupied, was not maintained by the two countries. The British government in 1881 made another attempt to compromise on a line including territory to the west of the Schomburgk line. Negotiations continued, but, in 1887, diplomatic relations between the two countries were suspended. A few years later the British government gave out that it would insist on the Schomburgk line. At the time when the dispute was at its height, the United States, which had previously offered its intervention, again proposed that the matter should be settled by arbitration. After much discussion and considerable excitement, the proposal of the United States was adopted, and a commission was formed of two members for Great Britain and two for Venezuela, who chose as their president King Oscar of Sweden.

VENIAL SIN (Lat. *veniale*, pardonable, from *venia*, pardon), a term used, chiefly in Roman Catholic theology, to denote the less heinous class of offenses against the law of God. Roman Catholic divines infer from many passages of Scripture that there are various grades of guilt in the culpable actions of man, and that these varieties of guilt involve a corresponding variation in the liability to punishment which is thereby entailed. Lowest in the scale of imputability is the class of offenses known as venial, and by this name distinguished from those which are called mortal. Much difference of opinion exists even among Catholics themselves as to the nature and origin of this distinction. Some ancient writers explained mortal sins as being offenses against a *precept*, whereas venial sins are but violations of a *counsel*. This explanation, however, is now universally rejected; and it is held that sin, of its very essence, whether mortal or venial, supposes the violation of a *law* or precept. Another explanation of the difference declares mortal sin to be that which deprives the soul of sanctifying grace; whereas venial sin only weakens and diminishes, but does not utterly extinguish sanctifying grace in the soul.

This is an explanation, however, rather of the effect than of the nature of venial sin; and the more received opinion is that of St. Thomas Aquinas, who explains mortal sin to be that which of itself subverts *the end* of the law; whereas venial sin but diverts it in a greater or less degree from that to which God intended that it should be directed. Catholics, while insisting on this distinction, are careful to explain that venial sin, although absolutely pardonable, is not to be supposed to be easily pardonable. They hold that it is of its own nature a great "deordination," and that it may and does entail a heavy liability to punishment, although not to the eternal punishment of hell, which is reserved for mortal sin. Sins may be venial either objectively or subjectively; objectively, when the "object" of the law, or what is technically called the "matter" of the sin, is light or trivial; as in the case of a petty theft, a slight departure from truth, or a passing ebullition of impatience or anger; subjectively, when, even though the "matter" or "object" is grave, there is but imperfect advertence, or not full consent, on the part of the subject or agent; as in the case even of a grievous injury done without full knowledge or intention on the part of the agent, or without full and deliberate consent. The degree of culpability in each case is supposed to depend on the objective or subjective qualification of the act. Catholics hold that persons dying in a state of venial sin are not excluded forever from heaven; but that, since nothing unholy, even though in a minor degree, can approach God, the soul departing from life so stained with venial sin, is compelled to undergo a purification in purgatory (q.v.), which they conceive to be of greater or less severity and duration according to the degree of culpability. Some of these writers teach that even venial sins involve punishment of extreme severity; and all expressly declare that it is never lawful, under any circumstances, to commit the smallest venial sin, even for the purpose of compassing a good and holy object.

Protestants reject the whole doctrine of *mortal* and *venial* sins. They regard all sins as, in one sense, *mortal*, i.e., as exposing the sinner to "the wrath and curse of God, both in this world and that which is to come;" but all sins of the believer are expiated by the blood of Christ, so that there remains no penalty to be paid, either by penances in this world, or by sufferings after death. The very notion of venial sins appears to them to make light of the law of God, while that of the expiation of venial sins by the sufferings of the sinner himself, is inconsistent with their doctrine of justification.

VENICE, a province in n.e. Italy, bordering on the Adriatic and adjoining Treviso, Udine, Padua, and Rovigo; drained by the Adige, Brenta, and Piare rivers; pop. '95, (est.) 3,080,153; 9476 sq. m. Capital, Venice.

VENICE, a fortified city of northern Italy, one of the noblest, most famous, and singular cities in the world, is built upon a crowded cluster of 118 islets, in the lagoon of the same name, on the n. w. fringe of the Adriatic sea, 23 m. e. of Padua by the Milan and Venice railway; lat. 45° 26′ n., long. 12° 20′ east. The lagoon of Venice is banked off from the Adriatic by a long, narrow sand-bank, extending s.w. from the mouth of the Piave to that of the Adige, and divided into a number of islands by narrow sea-passages, six in number. Formerly, the chief of these entrances into the lagoon was the Porto di Lido, through which all the great merchantmen of the republic passed direct into the city, and which is still frequented by small vessels, and by the Trieste steamers. The Porto di Malamocco, between the island of the same name on the s., and that of Lido on the n., is now the deepest channel into the lagoon. Inside of this sand-bank, and between it and the mainland, which is from three to five m. distant, is the lagoon—a sheet of shallow water, navigable for vessels of very light draught, except where channels have been formed naturally by rivers, and artificially maintained. In some parts of this marshy, sea-covered plain, islets have—by the action of currents and otherwise—become consolidated into ground firm enough to be built upon, and fruitful enough to be cultivated; and in the midst of a crowded cluster of such islets, amounting in number to between 70 and 80, the city of Venice is built. In the vicinity of Venice, the ebbing tide (the difference between high and low water is only between 2 and 3 ft.) lays bare nearly everywhere a great plain of calcareous mud, laced, however, by an intricate network of narrow channels, from which the sea never retires; while at high water the whole surface is covered by the sea to the depth of from 1 to 1½ feet. The chief of the islands upon which Venice is built is called *Isola de Rialto* (i.e., *rivo alto*), or Island of the Deep Stream. The islands, in many places only shoals, afford no good foundations for buildings; and the city, for the most part, is built upon artificial foundations of piles or stone. The fact that this city of marble palaces seems to rise vision-like from the unsubstantial sea, is sufficient to render its aspect at all times more or less fascinating; but in summer and autumn, the seasons of the highest tides, when the Grand Place of St. Mark's is partially flooded, and when the image of each palace is doubled by reflection in that "green pavement, which every breeze breaks into new fantasies of rich tesselation," the city is indeed marvelously beautiful. The Canalazzo, or Grand Canal—its tortuous course through the city being in the form of the letter S reversed—divides Venice into two unequal parts, and is the main thoroughfare for traffic or pleasure. But the city is sub-divided by 157 smaller canals,

or *rii*, as they are termed. These are the water-streets of Venice, by means of which passengers can be conveyed to any quarter, for here the canal is the street, and the gondola (q.v.) is the cab or carriage. Access can also be had to all parts of the town by land —across the canals by bridges, and among the houses by narrow lanes called *calli*. There are in all 306 public bridges, and of these, three cross the Grand Canal—the Rialto, a stone structure, and the most famous; and two iron bridges. The piazza or square of St. Mark's is the great center of business and amusement, and the locality most frequently visited by travelers in Venice. It is 576 ft. in length, 269 ft. in greatest width, and 185 ft. in least width. The e. side of this square is occupied by St. Mark's church. The first church of St. Mark's was built in 830, but was destroyed by fire in 976. It was rebuilt in 1071, and consecrated before the close of the 11th century. The edifice is Byzantine, with Gothic additions of the 15th c., and renaissance alterations of the 17th century. It became the cathedral and seat of the patriarch in 1807. The plan of St. Mark's is the Greek cross. Above the doorway are the four famous horses which Marino Zeno brought from Constantinople in 1204, which were carried away by Napoleon in 1797 to Paris, and restored to Venice in 1815. A great dome rises over the intersection of the lines of the cross; and over the transepts, other domes arise. The carved work, which is very profuse, is of the most exquisite description; and the building is perfect as an example of the delicately-colored architecture of the east. The structure is of brick, incrusted with richly-colored marbles. To the right of this beautiful edifice is the *Torre dell' Orologio* (built in 1496), with a splendid dial in gold and azure, and very complex and ingenious movements. The n. side of the square is almost entirely taken up by the *Procuratie Vecchie*, built in 1517, for the accommodation of the procurators or trustees of San Marco, who had the care of the edifice, the management of its property, etc. Facing the procuratie Vecchie, and on the s. side of the square, are the buildings of the *Procuratie Nuove*, which are connected with a façade, which forms the w. side of the square, and the two buildings constitute the *Palazzo Imperiale*. Leading s. from the piazza is the piazzetta, or little square; and near the point where it makes an angle with the great square, is the Campanile, or bell tower, of St. Mark, placed at some distance in front of the building to which it belongs. It was founded in 888, and rebuilt in 1329, is 322 ft. high, 42 ft. wide at the base, and is surmounted by an angel, which serves as a weather-cock, and is said to be 16 ft. high. On the w. side of the piazzetta are the old library and the mint, the former now forming a part of the Palazzo Imperiale. At the s. of the piazzetta are the two famous red granite columns of Venice, one of which is surmounted by a figure of St. Theodore, the patron saint of the republic till St. Mark supplanted him; the other covered by the lion of St. Mark. On the e. side of the piazzetta stands the palazzo ducale or doge's palace. The first palace reared on the site of the present one was built in 813, and though frequently enlarged, rebuilt, and redecorated, it retained throughout the character of a Byzantine structure. In the year 1301, its architectural character began to change; and from that time till 1423, all the rebuilding and enlarging were executed in Gothic. After the date 1423, there are no buildings in Venetian architecture, properly so called; and the alterations made in the ducal palace after that time, as well as the palaces subsequently built, which took their style of architecture from the doge's palace, were in renaissance, and like almost all the architecture now to be seen in Venice, "of immeasurably inferior spirit in the workmanship" to that native style which flourished with the republic, and decayed with it. Starting from the landing-place of St. Mark's at the e. extremity of the Grand Canal, and proceeding w., a great number of palaces are passed. In former times, these palaces, or the magnificent buildings which occupied the same sites, were the warehouses and places of business of the great merchant-princes, most of whom possessed mansions in the suburbs, i.e., on some neighboring island, which afforded more privacy than could be found in the city itself. A few of these are worthy of mention. Among them are the *Palazzo Giustiniani*, now the *Albergo dell' Europa*, perhaps the best hotel in Venice; the *Palazzo Contarini Fasan*, a beautiful specimen of the richest Venetian Gothic of the 14th c.; on the left bank, the *Palazzo Pisani a S. Paolo*, in arabesque Gothic of the beginning of the 15th c.; further on, on the right, the *Palazzo Loredan*, the *Ca' d'Oro*, a building of the 15th c., in the oriental style, restored by Mlle. Taglioni, the celebrated dancer. The bridge of the Rialto crossing the Grand Canal consists of one arch, the span of which is 74 ft., and the height from the water 32 feet. The width is 90 ft., and the bridge is divided into three streets—the middle one 21 ft. wide—and two rows of shops. The Bridge of Sighs (*Ponte dei Sospiri*) stretches across the canal called the Rio Palazzo, and communicates between prisons on the e., and the Doge's palace on the w. bank of the canal. It is a covered gallery; and prisoners, when led to execution, passed from their cells across this gallery to the palace, to hear sentence of death passed upon them, and then were conducted to the scene of death between the red columns. The churches of Venice are, as a rule, fine edifices, and of various styles. The styles are chiefly, first, Venetian Gothic, massive and solemn; second, Lombard; third, classical, i.e., Italian; fourth, decorated Italian. Among the chief churches after St. Mark's are those of the *Frari*, with a colossal monument of Titian, a number of excellent pictures, etc.; and the church of *S. Giacomo di Rialto*, at the foot of the bridge of the same name, occupies the site of the first church erected in Venice in 421. But of the multitude of churches, a great many, though of pleasing proportions, are in the later and degraded

styles of architecture. The fine art *academia* is located in the ancient convent of *La Carità*, was formed in 1807 by Napoleon, and consists of several schools, and has the finest collection of pictures of the Venetian school, including works by Titian, Tintoretto, Bonifacio, Giovanni Bellini, Paolo Veronese, and many other masters. Specimens of the works of these artists are also to be found in many of the palaces and churches of the city. There are several theaters, the chief of which is *la Fenice*. Fresh water, formerly, and even still to some extent, obtained at great expense, and of bad quality, from the mainland, or kept in cisterns, is now obtained by means of a number of artesian wells, sunk in 1847, at the expense of the municipality. The library of St. Mark's contains many valuable documents. Many writers have led to misconception by omitting to note the fact, that the Venice of to-day is by no means the same city as the Venice of earlier and more famous days. On this subject, it will be of interest to quote the following from Ruskin's *Stones of Venice* (vol. ii., pp. 4, 5): "The Venice of modern fiction and drama is a thing of yesterday, a mere efflorescence of decay, a stage dream, which the first ray of daylight must dissipate into dust. No prisoner whose name is worth remembering, or whose sorrows deserved sympathy, ever crossed that 'Bridge of Sighs,' which is the center of the Byronic ideal of Venice; no great merchant of Venice ever saw that Rialto, under which the traveler now passes with breathless interest." Among the chief manufactories of Venice are the glass-works, in which magnificent mirrors, artificial pearls, gems, colored beads, etc., are made, and which employ 4500 people. Jewelry, especially chains of the precious metals, gold and silver stuffs, silks, laces, velvets, soap, earthenware, wax-candles, etc., are also manufactured; and sugar-refining and ship-building are carried on. The trade of Venice greatly declined for several years previous to 1866. This decline, however, being due to the uncertainty and unsatisfactory political state of the Venetian provinces, there have been signs of revival since the incorporation of Venice with Italy. The goods exported consist in the main of grain, fruits, fish, and wine, while those imported consist chiefly of cotton, coals, coffee, colonial produce, woolen and linen yarns, and manufactured goods. In 1895, 3549 vessels of 1,197,307 tonnage entered, and 3444 of 1,209,721 cleared the port of Venice. Pop. (1881) of town, 129,276; of commune, 132,826. Pop. cummune '95, 153,900.

History.—Previously to the Roman conquest, we know almost nothing of the history of Venetia; but, at the time when that event took place, we know that this region was inhabited by two nations, the Veneti and the Carni. The Veneti, from whom the district derived its name, occupied the tract between the Plavis (Piave) on the n., and the Athesis (Adige) on the south. The origin and affinities of this people are unknown, and almost the first thing ascertained concerning them is that, in the very earliest times of which we have any record, we find them a commercial rather than a warlike community, carrying on a trade in amber, which they brought from the shores of the Baltic, and sold to the merchants of Phenecia and Greece. Under the Roman empire, the province became opulent and flourishing; and besides its capital, Aquileia, which rose to be one of the most prosperous cities in Italy, it contained also the powerful and wealthy provincial cities, Patavium (Padua) and Verona, and numerous important towns. But before the close of the empire, the early prosperity of this province was swept away by the Huns under Attila, who, in 452, raised Aquileia to the ground, and devastated the cities of Concordia, Altinum, Patavium, Vicentia, Verona, and other cities of the province. Many of the inhabitants of these cities, driven from their ruined homes, sought shelter in the marshy lagoons, in a position too miserable to provoke the ambition of the conquerors, and defended from invasion from the main-land by the wide tract of muddy shallows which intervened between it and the actual shore, and secured against attack by sea by the shallowness of the water and the intricacy of the sea-passages. Of the cluster of islands upon which ancient Venice stood, the principal were Grado Bibione, Caorlo, Heraclia, Equilo, Torcello, Murano, Rialto, Malamocco, Pelestrina, Brondolo, San Nicolo, Chioggia (Piccola and Grande), Amiano, Constanziaco, Olivolo, and Spinalunga. To Rialto and to Malamocco, the refugees from Padua resorted. The name of the province they had left was afterward transferred to the cluster of the islands of the lagoon—the new settlement being commonly known, at least as early as the 8th c., as Venezia, or as we have it, Venice. Protected by the peculiar position of the islands in which they had found refuge, the early settlers devoted themselves to the pursuits for which their situation offered the greatest facilities—fishing and the manufacture of salt. Houses began to cluster thickly on the Rialto; and when, in 568, Padua was sacked by the Lombards, many of its inhabitants emigrated to that infant colony which their ancestors had helped to found. The first form of government of the island-commonwealth was republican, administered by a consular triumvirate; but in 457 the consuls were superceded by tribunes who, elected annually, and varying in number at different times from 1 to 12, administered the government for 240 years. But during this period, although the young republic progressed in wealth and population, it did little to increase its political importance. Society was divided into factions by the ambition of the rival tribunes, and variety of interests rendered united action in warfare impossible. With the purpose of remedying the many evils of the government, Christofero, patriarch of Grado, in 697, laid before the arengo—the periodical convention of the whole adult male population—a scheme in which he proposed that the tribunes should abdicate sovereign

power, and that a magistrate, with the title of duke or doge, in whom should be vested undivided authority in civic, ecclesiastical, and military matters, should be placed over them. The proposition was received with much favor, and the election to the office fell upon Paolo Luca Anafesto, who was invested by the metropolitan with his insignia of office, a crown of gold, and a scepter of ivory, March, 697. Anafesto remained at the head of affairs till his death in 717, and under his rule the position of the republic greatly improved. Civil discords were in great measure stilled, and the Venetian territory was increased by the acquisition of a strip of the main-land, obtained by treaty from the king of the Lombards. Under Orso, the third doge (720–737); the Venetians entered upon that career of enterprise in which their prudence and their valor were always equally conspicuous, and which they continued to pursue to the last. In 735 the Lombards seized Ravenna, compelling the exarch (q.v.) to seek shelter in the lagoon, and implore the republic to lend her aid in reacquiring the lost territory. Still considering themselves as nominally subject to the eastern emperor, besides being anxious, in the interests of their commerce, of securing the alliance of Constantinople, and of obtaining the freedom of the seas of the eastern empire, the Venetians supplied the required assistance, and reinstated the exarch in his vice-royalty. The services of the doge on this occasion were rewarded by the Byzantine court with the honorary title of Hypatos, or imperial consul. The common punishment among the Venetians for tyranny was putting out the eyes, and the reigns of several of the doges at this time are but periods of tyranny and excess on the part of the ruler, terminated by exoculation or assassination by the people. By a treaty concluded in 803 between Charlemagne and the emperor of the east, it was stipulated that the maritime towns of Istria and Dalmatia should be considered an integral portion of the eastern empire. This stipulation was adhered to till the year 808, when the aggressive policy of Charlemagne and of his son Pepin, now king of Italy, prompted Nicephorus, the emperor of the east, to dispatch a squadron to the Adriatic, and to seek the alliance of the Venetians; and as the latter perceived that they had much more to gain from the friendship of the court of Constantinople—the key to the rich waters of the east—than from that of Charlemagne, the alliance was soon cemented. War immediately broke out, and Venice was invaded by king Pepin, who took a number of the islands without meeting any resistance—the inhabitants having all been transferred to the central island, Rialto. The French advanced to the island of Albiola, when, to their dismay, they found that the tide had been ebbing, and that their vessels were stranded in these shallows. The whole French squadron now fell an easy prey to the swift-moving galleys of the Venetians, and such of the enemy as escaped being drowned were massacred by the relentless islanders (809). This struggle, called the battle of Albiola, was conducted on the part of the republic by Angelo Badoer, tribune of the island of Rialto, who was raised to the rank of doge, and transferred the seat of government to Rialto—the island of Heraclia and others having previously enjoyed that honor. In his reign, also, connection was established between Rialto and all the circumjacent islands, by means of wooden bridges, and the cluster thus united now formally took the name Venezia (Venice), although it commonly received that name early in the previous century. The year 827 is memorable as that in which, according to tradition, the body of St. Mark was transferred to Venice from Alexandria. "That the Venetians possessed themselves of his body in the 9th c., there appears," says Ruskin, "no sufficient reason to doubt;" and however we may regard this story, it cannot be denied that the belief in it by the Venetians and others attracted crowds of pious pilgrims to Rialto, and thus increased the traffic and prestige of the port; while the Venetians adopted St. Mark as their patron saint; and their war cry, "Viva San Marco!" inspired their courage in many a fight, both on sea and land. For many years after this date the history of Venice is marked by no event of special note; but the naval importance, the commerce and wealth, and refinement of the republic, increased year by year. Doge Orseolo II. (991–1008) greatly extended the trade of the republic by establishing commercial relations between it and the empires both of the east and west, the Crimea, Syria, Egypt, Tartary, Tunis, etc.; and under his rule, the territory of Venice, which, until lately, comprised only the islands of the lagoon, and a narrow slip of territory on the mainland, was increased by further acquisitions on the mainland, and by the addition of the sea-boards of Dalmatia and Istria, which he annexed in 998. In 1085 the provinces of Dalmatia and Croatia were formally ceded to Venice by the emperor of the east; and at the same time the emperor exempted the Venetian traders in all parts of the empire, excepting in Cyprus, Candia, and Megalopolis, from all duties and imposts whatever. In 1099 Venice sent forth a fleet of 207 vessels of all sail to the succor of Godfrey de Bouillon and his companions of the first crusade. The defeat of a hostile Pisan fleet employed by the eastern emperor, Alexius Comnenus, and the capture of 20 of the vessels, and the obtaining of the body of St. Nicholas at the island of Myra, were the chief incidents of this expedition, which partook more of the nature of a predatory cruise than of a pilgrimage and crusade. But it is noticeable that in all the cases in which Venice joined the crusaders, the chief motive seems rather to have been to monopolize the maritime department of all these movements, and to extend her commercial relations, than to secure the holy sepulcher in Christian possession. The great fires of 1106, which, besides destroying the island city of Malamocco, reduced 30 churches and vast numbers of private dwellings in Venice to ashes, were indirectly the

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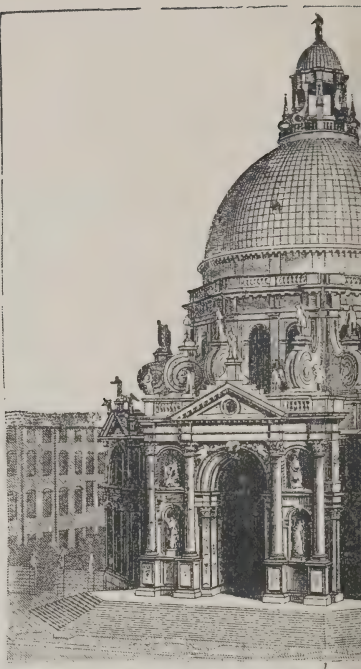

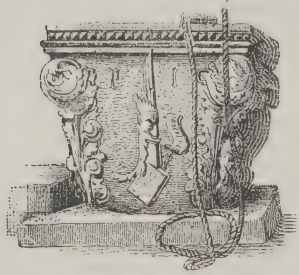

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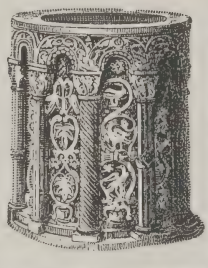

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VENICE AND VERONA.—1. Sta Maria della salute. 2. Doge's Palace. 3. We

rbs. 4. San Marco. 5. Church of the Savior. 6. Church of St. Zeno, Verona.

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cause of great improvements in the architecture of the city; for previously to this event, the dwellings of the Venetians were almost all built of wood; but after it, the material used was always either stone or marble obtained from Italy, Istria, or Dalmatia, in all of which it is found in abundance. In 1111 the doge Faliero sent forth 100 galleys to aid Baldwin I., the successor of Godfrey de Bouillon, in the conquest of such Syrian ports as remained in the hands of the Mussulmans; and for the assistance thus rendered, the Venetians obtained the right to hold in possession a church, street, mill, bakery, bath, etc., and to be represented by a local magistrate in each of the oriental possessions of christendom—rights of the very greatest importance to a trading community. In 1123 a fleet sent to succor the Christians in Palestine, and led by the doge Michieli, distinguished itself by gaining a magnificent victory over an Egyptian fleet, and by the capture of ten Turkish galleons richly freighted. In the same year, the Venetians and their allies, the Christians in Palestine, reduced the almost impregnable city of Tyre, after a siege of four and a half months. In 1122 a decree was passed by Johannes Comnenus, the eastern emperor, commanding the Venetian residents at Constantinople and the other Greek ports to quit the imperial dominions, and declaring the suspension of all intercourse between the two powers. The islanders thus saw the most profitable branch of their commerce threatened with extinction; and resolved to make reprisals, they launched a fleet in 1123, and in that and the following year they inflicted a terrible punishment on the empire, capturing Rhodes, and investing and sacking Andros, Samos, etc., all the Ionian islands, a portion of the Peloponnesus, etc. Further, this brilliant expedition was not brought to a close until all the Dalmatian fiefs, stirred to insurrection by Stephen, king of Hungary, were again reduced to submission. The Venetians were prominent members of the league of Lombardy against the German emperor; and in 1177 won a splendid victory over the Ghibellines, headed by Otho, son of Frederick Barbarossa, in defense of Pope Alexander III., who had appealed for protection to the republic. Otho's squadron numbered 75 sail, chiefly drawn from the ports of Genoa and Ancona; the Venetian force consisted of 34 large galleys; and the victory they gained influenced the pope to show his gratitude by presenting the doge Ziani with a ring, with which he commanded him to wed the Adriatic, that posterity might know that the sea was subject to Venice "as a bride is to her husband;" and it is recorded that in this year the pompous ceremony of the "marriage" was celebrated for the first time. The result of the naval battle of Saboro was that Frederick agreed to a congress, which took place at Venice in 1177. On the occasion of this congress, when the pope, the doge, and other dignitaries were assembled in the palace of St. Mark's, Frederick approaching the throne on which Alexander III. was sitting, and prostrating himself, allowed the pope to plant his foot upon his neck. The congress of Venice restored peace between the empire and Lombardy and Sicily. The doge Ziani died in 1178. He did much to improve the architecture of the city, especially of the square of St. Mark. Of the three lofty red granite pillars which he is believed to have brought from the island of Scio, two adorn the portico of St. Mark's—the third fell overboard and was lost in the attempt to land it. In Oct., 1202 the expedition known as the fourth crusade set out from Venice, in Venetian vessels, under the command of the venerable doge, Arrigo Dandolo; it did not, however, reach Palestine, but directed its force against the Byzantine empire, which fell into the hands of the so-called crusaders, April 1204. See Dandolo. On the division of the conquests of this expedition, Venice received the Morea, the Illyric isles, a large portion of Thessaly, the Sporades, the Cyclades, the cities of Adrianople, Trajanople, Dedymotichos, and Durazzo, the province of Servia, and the coasts of the Hellespont. A fourth part of Constantinople was set apart as a quarter where the Venetians might reside, under the protection of their own laws; and all restrictions as to trade were abolished. Venice was now in possession of the fairest portions of the lower empire, and she had long been undisputed mistress of the seas. As she increased in power, she also increased in magnificence; and her nobles, having no lands in which they might employ their wealth, lavished immense sums upon their palaces, their pictures, decorations, and costly garments. Her palaces were decorated with the treasures and spoils of the east, and a school of artists arose, who found noble subjects for their pencils in the deeds of Faliero, Polani, Ziani, and the Dandoli. Her noblemen were now the most opulent in Europe, and travel and refinement had made them also the most polished. The most notable events in the history of Venice during the 13th c. are her wars with Genoa, in which her hitherto unfailing good fortune deserted her, and the star of Dandolo succumbed to that of Doria at the desperate battle of Corzuola, from which conflict the Venetians could only retire with 12 out of 96 of their galleys, the others being taken or burned; the truce effected between Venice and Palæologus, the emperor of the east, in 1268; the electoral reforms by which, after a complex and often repeated process of election and reduction by lot, the forty-one members were chosen who formed the electoral college, and of whom it was necessary that the doge-elect should obtain at least the votes of twenty-five. In 1289 the inquisition was formally established in Venice, but this institution was rendered subject to so many limitations by the government of the republic, that it remained comparatively harmless. In 1310 a conspiracy was formed for the correction of abuses that had crept into the constitution, and for the punishment of actual and fancied crimes. Among the conspirators were members of many of the noblest families of Venice. This

conspiracy, known as the Quirini-Tiepolo conspiracy, proved abortive; but among other reforms to which it gave rise was the formation of the famous council of ten, who caused themselves to be declared a permanent assembly in 1335. In 1343, Andrea Dandolo, born in the year of the Quirini-Tiepolo conspiracy, a most accomplished scholar and statesman, was raised to the dogate. His *Venetian Annals*, remarkable for their precision and accuracy, place their author in the first rank of mediæval historians. In 1348, the lagoon was visited by an earthquake, accompanied by unusually high and destructive tides. These misfortunes were followed in the same year by a most frightful visitation of plague; and in the course of the six or seven months during which the epidemic raged, two-fifths of the population of the city perished, and fifty patrician families became extinct. The middle of the 14th c. is remarkable for the famous conspiracy headed by the doge Marino Faliero (see FALIERI), and for a war with Hungary, in which Venice lost Dalmatia. The commercial rivalry of Venice and Genoa in the east led to a war in 1352, in which the Venetians were defeated (Feb. 13, 1352) by Paganino Doria in the straits of the Bosporus; and though they recovered their lost laurels in a battle (Aug. 29, 1353) off the Sardinian coast, their fleet was totally destroyed by Doria, in the gulf of Sapinoza, Nov. 3, 1354, and they were forced to make peace in the following May. In 1378, the Venetians interfered in the quarrel between the Genoese and Cypriots, and their fleet vanquished that of the Genoese before Antium (July), in revenge for which the Venetian fleet was almost annihilated off Pola (May, 1379), and Pietro Doria, advancing upon Venice itself, seized the island of Chioggia. But the courage of the Venetians was nothing weakened by their dreadful reverses, and they soon changed the aspect of affairs by becoming in turn the besiegers themselves, blockading the enemy in Chioggia, and, after reducing him to the brink of starvation, accepting an unconditional surrender, June, 1380. In 1396 Genoa, the oldest and most harassing foe of the republic, ceased to have separate existence as an enemy, for in that year she placed herself under the dominion of the king of France, an arrangement which afforded immeasurable relief to Venice, because, for several reasons, there was now much less chance of a rupture between the two maritime powers. For a number of years after this event, Venice experienced the highest prosperity: a prodigious impulse was given to her trade; her argosies traversed every arm of the ocean; intimate intercourse was kept up with every European country, as well as with Syria, Egypt, and even India, and important articles of Venetian merchandise were the iron of Staffordshire, the tin of Cornwall and Devon, and the wool of Sussex. But no less beneficent than the effects of peace were those of the war which soon broke out between Novello, lord of Padua, and Venice. At the conclusion of this war (1407), Venice found herself in the possession of an empire on the mainland of Italy, the smallest communal section of which equaled their ancient island domain, and of which the principal cities were Vicenza, Verona, Padua, Feltre, and Belluno. With the death of the doge Mocenigo in 1423, a new era in the existence of Venice commences, for now "the central epoch of her life was past, the decay had already begun." During the next thirty years, war was continually waged, chiefly against the dukes of Milan, in the course of which Venice, taking into pay Carmagnola (q.v.) and his bands achieved many a splendid victory, and suffered many a disastrous defeat; and though, on the return of peace (1455), the territory of the republic was materially increased, by the acquisition of Brescia, Bergamo, Treviso, etc., on the mainland, this territory was obtained only after a struggle, enormously expensive in life and treasure, and during the continuance of which the commerce of Venice—the well-spring of its prosperity at all times—began to decline. Mocenigo's last advice to the senate was to avoid war, which was certain to bring destruction on the country, and to prosecute industriously their trade and commerce, and cultivate the arts of peace. The rejection of this advice, combined with the narrow-minded selfish policy always pursued by the Venetians in the contests among the Italian states, was the prominent cause of its decline. The same fatal warlike policy was pursued throughout the 15th c.; and the whole of the 16th c. was employed by them in repairing the disasters which the league of Cambrai had brought upon them. Her policy in the 17th c. was to aid the opponents of her most dangerous neighbor, Austria, by recognizing Henry IV. of France, aiding Bethlem Gabor and Ragotski, the duke of Savoy, against Spain, and the Protestants against the Catholics of the Grisons. From 1646 to 1669, war was carried on between the Venetians and Turks, the latter being, in almost every encounter, severely defeated; though, from the disproportionate strength of the antagonists, they ultimately gained Candia, the object of the war. The discovery of the cape of Good Hope by the Portuguese in 1486, opened up to that nation an ocean-route to India, which was taken advantage of by Vasco da Gama, who rounded the cape on his voyage from Lisbon to Calicut in 1497. The carrying-trade of the world was now no longer, as it had been, in the hands of the Venetians; and the vast commercial activity which sprang up among the western nations of Europe upon the discovery of America clearly showed that the naval superiority of the republic had forever disappeared. But even in spite of these changes of fortune, Venice might still have maintained a respectable mediocrity among maritime states, but for the character of her government, which was conducted by an exclusive oligarchy, in whose hands alone all power and freedom were vested. Long prior to the invasion of the republic by Napoleon in 1796, Venice had become worn out and corrupted; the government of the council of ten had become a reign of terror; its nobles

showed vigor only in the pursuit of pleasure; its peasants, inured to peace, were unequal to war—all the ancient virtue, valor, and hardihood, which had raised a colony of fishermen, "perched like sea-fowl" on a muddy shoal, to be a nation of the first rank, had died out of the state. Napoleon forced Venice to break the neutrality which it meant to maintain in 1796, destroyed its government, and ceded the province to Austria by the treaty of Campo-Formio (q.v.). In 1806, the city of Venice, with the territory of Venetia, was annexed to the kingdom of Italy by the treaty of Presburg (q.v.); but it was transferred to Austria in 1814. In 1866 the city and territory were ceded to and incorporated with the kingdom of Italy.

VENETIA, TERRITORY OF, ceded to Austria in 1815 (see above), formed from that year, along with Lombardy (q.v.), what was called the Lombardo-Venetian kingdom, one of the Austrian crownlands. In 1859 Lombardy was ceded to Italy, but Venetia continued in the possession of the Austrians till 1866, when, as one of the results of the famous "Month's War," it also was ceded to Italy, and is now incorporated with that kingdom. While still in Austrian possession, Venetia was regarded as bounded on the n. by the Austrian crownlands of the Tyrol and Carinthia; on the e. by Görz and Gradisca; on the s. by the Adriatic sea, the river Po, and the duchy of Modena; and on the w. by the river Adige and the Tyrol. The territory of Venetia, ceded to Italy by the treaty of peace, Oct. 3, 1866, has the same frontiers which it had as an Austrian province.

VENI CREATOR SPIRITUS, an ancient and very celebrated hymn of the Roman breviary, which occurs in the offices of the feast of Pentecost, and which is used in many of the most solemn services of the Roman Catholic church. Its author is not known with certainty. On the authority of an ancient life of Notker, it is ascribed to Charlemagne; and Daniel, in his *Thesaurus Hymnologicus*, adopts this opinion; but it seems to be certainly older than the age of Charlemagne; and its correct classical meter, as well as the purity of its language, bespeak an earlier and purer age. Mone makes it highly probable, by intrinsic evidence, that it is the composition of Pope Gregory I. The Veni Creator Spiritus must not be confounded with another hymn to the Holy Ghost, Veni Sancte Spiritus, which somewhat resembles it. The latter belongs not to the breviary, but to the missal, in which it forms a "sequence" in the mass of Pentecost Sunday and Octave. The latter hymn is not in classical meter, but in rhyme; and its language is plainly of a lower age. The author of the Veni Sancte Spiritus is believed to be king Robert of France, to whom several other hymns of the same class are attributed.

VENIRE, or VENIRE FACIAS, in law, a writ to the sheriff of the county, ordering him to choose and summon from the county, and have in court on a day named a certain number of qualified citizens of such county to act as jurors in the court. This was the common law method of summoning a jury, but in many states jurors are drawn by lot from a list of qualified persons made by the proper local authorities; in New England, by the selectmen of the town. The sheriff then summons without a *venire*, which is, however, still used to summon additional jurors.

VENISON. A name originally applied to all game. In Genesis XXVII. 3, Jacob says to Esau: "Now therefore take, I pray thee, thy quiver and thy bow, and go out to the field, and take me some venison," meaning the wild kid. In England the term venison may still be applied to the flesh of the hare and certain birds, as well as to that of the deer. Buck-venison is best from Aug. 1 to Nov. 1; doe-vension from Nov. 1 to Jan. 1. Venison is cut into joints and sold as saddle, haunch, leg, loin, fore-quarter and steak.

VENLO', a small but strongly fortified t. in the Netherlands, province of Limburg, is situated on the right bank of the Maas, 60 m. n.w. of Cologne, and has a safe little haven. The fortifications are very irregular, consisting of a main wall, canal, outworks, three powder-magazines, etc. The town is well built, and stands on elevated ground, surrounded by morasses. Principal buildings are the town-house, the great arsenal, the church of St. Martin, etc. Venlo manufactures cigars, gin, and needles. Pop. '93, 12,154.

VENN, Rev. HENRY, a pious clergyman of the Church of England, was b. at Barnes in Surrey in 1724. Having studied and entered into holy orders—in this respect following the example of his paternal ancestors since the reformation—he was shortly after appointed curate of Clapham. In 1759 he resigned his curacy to become vicar of Huddersfield in Yorkshire, which he left in 1769, on being presented to the rectory of Yelling in Huntingdonshire. He died in the house of his son, John Venn, rector of Clapham, in June, 1797. The memory of his pure life, good example, and earnest preaching was cherished for many years after his death in the places which had benefited by his ministration; and his name is associated with those of John Newton, Thomas Scott, Charles Simeon, and others, as having had considerable influence on the evangelical movement in the church of England. Venn was the author of a book entitled *The Complete Duty of Man*, a sort of development or extension of the *Whole Duty of Man*. His *Life and Correspondence* was published by his grandson, Henry Venn, in 1839.

VENOMOUS BITES AND STINGS. Under this title are considered all wounds inflicted by animals which by their bites or stings introduce poisonous or irritating matter into the bodies of their victims. In this country the subject is of comparatively little importance, since it is very seldom that the bite of our most venomous animal—the adder—is fatal; but in warmer countries it demands the serious attention of the surgeon. Following Mr. Busk, in his article on "Venomous Insects and Reptiles," in Holmes's *System of Surgery*, we shall briefly enumerate the most venomous animals found (1) among the invertebrata, and (2) among the vertebrata.

(1) Among the invertebrata, the most formidable poisonous animals are to be found in the classes *arachnida*, *myriapoda*, and *insecta*. The *scorpions* are characterized by a prolonged jointed abdomen, terminating in a hooked claw, which is perforated, and connected at the base with poison-glands. The larger species, which are restricted to hot countries, by their sting give rise to symptoms of great severity, and occasionally cause death. "The symptoms resemble those produced by the stings of wasps and bees in an aggravated degree, such as acute pain, a general nervous shock attended with numbness, vertigo, occasionally temporary loss of sight, vomiting, etc.; while the local symptoms are swelling, and other signs of acute inflammation, followed, in many cases, by suppuration, sloughing, and their consequences. The remedy which appears to have obtained the greatest repute, is the application of ammonia externally, and its internal administration as a stimulant also; although it is probable that any other diffusible stimulus, combined with opiates, would be equally, if not more efficacious."—Busk, *op. cit.*, p. 921. Several species of *scolopendra*, or *centipedes*, are regarded as highly venomous, and there is no doubt that the bites of some of the larger kinds inhabiting hot countries (especially of *S. morsitans*), give rise to excessively painful consequences, although less severe than those occasioned by the sting of the scorpion. In these animals, the poison is introduced not by a caudal sting, but by perforated curved fangs, connected with the mandibles, where poison glands doubtless exist, though their existence has not been clearly established on anatomical evidence. Although *spiders* have long had a bad reputation for their venomous bites, it is quite certain that (with certain rare and foreign exceptions) their bite inflicts no more than a simple wound. The most ill-famed of the spiders is the tarantula or tarentula (*lycosa tarentula*), a citigrade or running spider, common in south Italy. See TARANTISM. Direct experiments, however, show that the bite of this spider merely causes a slight local irritation. There is a spider inhabiting the island of Elba (*aranea 13-guttata*), which is said to be dangerous and even fatal to men and domestic animals; while the cork-forests of Morocco are said to be infested by an equally formidable spider, which is there known as the *tendevaman*. It would be well if scientific travelers in those countries would obtain more definite information regarding these spiders. Among insects, many inflict more or less troublesome bites, while a comparatively few (and those almost, if not altogether, restricted to the order *hymenoptera*) inflict serious injury by their stings.

In the case of the majority of biting insects, it is very doubtful whether the local discomfort is due to the introduction of poison, or is the consequence of the prolonged mechanical irritation only. In some cases, as in the ants, we know that formic acid (an irritant of great power) is introduced; and considering the prolonged irritation that follows the bites of many small insects, it is probable that there is some special acrid matter in their salivary secretion. This view is further borne out by the fact, that persons who suffer much from the bites of fleas and bugs (and the degree of annoyance varies extremely in different persons), are relieved by the local application of hartshorn, or some other preparation of ammonia. The "tsetse" (*glossinia morsitans*), whose ravages are so graphically described by Dr. Livingstone, does not attack man, but it affords an example of an insect, very little larger than a house-fly, being able to secrete an intense septic poison, which, introduced by its bites, causes certain death to cattle, the sheep, horse, and dog, while it is innocuous not only to man, but to the goat, antelope, ass, and pig, to all wild animals, and to the calf until it is weaned. Another insect, mentioned but not described by the same traveler, produces by its bite vomiting and purging in man. In the case of stinging insects, the stinging instrument consists essentially of two fine and sharp dots, enclosed in a tubular sheath, at the base of which is a poison-sac, whose contents are injected into the wound made by the darts, which are usually serrated or barbed. The consequences of the sting of a bee or wasp are too familiar to require any detailed notice; and the sting of the hornet, a much rarer insect, is of the same nature, but of an aggravated form. The sting of a bee or wasp scarcely ever proves fatal, except the insect is swallowed in a cavity in ripe fruit, or in the act of drinking, and inflicts its sting on the throat. A sting in the fauces usually excites severe and diffuse inflammation, which may extend to the glottis, and thus cause suffocation. The treatment must be prompt, and consist of scarification internally, leeches externally, and possibly tracheotomy. When a large number of any of these insects make a combined attack, the result may be fatal. For the bites and stings of all these animals, the remedy recommended for scorpion-stings must be used; namely, ammonia in some form or other, and probably sal-volatile is the best. Among various domestic remedies for allaying the irritation excited by these stings, are vinegar, oil, spirits, eau-de-cologne, the blue-ball employed by washerwomen, consisting of indigo, etc. If possible, the sting

should be extracted by bringing it to view by pressure over the wound with a watch-key, and then seizing it by small forceps.

(2) Among the vertebrata, the only animals capable of inflicting poisoned wounds are the ophidian reptiles or snakes. As the description of the mechanism of the poison-fangs of venomous snakes is sufficiently given in the article SERPENTS, we may pass on to the subject of the nature of the *venom* and its effects. The venom is described, when fresh, as a transparent, yellowish or greenish, somewhat viscid, neutral fluid, much resembling saliva in its physical character, and exhibiting no obvious indication of its virulent nature. According to Prince Lucien Bonaparte, it contains, in addition to albuminous or mucous and fatty matters and the usual salts, a peculiar principle, to which he has given the name *echidnine* or *viperine*, which appears to be the active poisonous matter. The poison of the most deadly serpent produces no effect when introduced into the stomachs of living animals, excepting a slight irritation of the air-passages; nor is its effect more serious when applied to the surface of the skin when free from abrasion. From the experiments of Fontana "on the poison of the viper," and other observers, it seems that the venom must be introduced, directly into the subcutaneous cellular tissue. When, however, properly introduced, as through its natural channel, the poison-fang, "its effects are very rapidly manifested; in fact, in some cases so rapidly as more to resemble those of prussic acid than anything else; usually, however, a brief interval elapses before the effects are shown. These may be divided into general and local. The first symptoms in nearly all cases appear to be a general shock to the nervous system, attended with faintness, tremor, and great depression, sometimes with stupor, loss of sight, vomiting, lockjaw, and general insensibility; at the same time, great and sometimes intense local pain is set up. The limb, if the wound is in one of the extremities, rapidly swells. In severe cases, the swelling continues to spread till it reaches the trunk, or even the entire body, whose surface assumes a jaundiced hue. The gravity of the effects of the bite of a venomous snake appears to be in direct ratio to the comparative sizes of the snake and its victim, and also to the quantity of the poisonous secretion present at the time in the saccular gland. It is also greatly governed by the situation of the wound; one on an extremity, for example, being far less dangerous than one on the face or trunk. It has been remarked that two or more wounds at distant points are more rapidly effective than when they are inflicted on one spot."—Busk, *op. cit.*, pp. 926, 927. The poison is one which seems to act primarily on the nervous system, and also to have a septic action on the tissues with which it is brought in contact; and in order to produce its effects, it must be directly introduced into the circulation.

The viper is the only poisonous snake in Gt. Britain; but in other countries, there are many snakes whose bite is fatal. America possesses the rattlesnake; the East Indies, the cobra da capello, the ophiophagus, daboia Russellii, etc.; and Africa and Australia are rich in poisonous reptiles. The bite of the viper presents in a mild form the typical symptoms which have been described, and is very seldom fatal. In the case of many snake-bites, however, rapid death is the general result; and should recovery take place, it will often be very protracted and imperfect.

The symptoms produced by the bites of different kinds of venomous serpents, differ considerably in character as well as in intensity, although there is a general resemblance.

The treatment may be divided into local and general. The local treatment consists in the *immediate* application of a ligature drawn as tightly as possible above the wound—provided the situation of the latter allow of it—to prevent absorption, and the excision and cauterization of the bitten part, and then, after bathing it with warm water, sucking or capping it. When the position of the bite prevents free excision, the poisoned tissues must be destroyed by *liquor ammoniæ*, or nitric acid. The general or constitutional measures consist essentially in the very free administration of the most powerful diffusible stimulants, such as hot strong brandy or whiskey and water, and ammonia (an ammoniacal preparation, known as *eau de luce*, is a popular remedy for snake-bites). In these cases, in consequence of the prostration of the patient, he can bear an extraordinary quantity of stimulants. For the bite of the rattlesnake, the popular treatment is to make the patient drunk—a process known as the *western cure*. Olive oil, freely administered, has been strongly advocated. We append in a foot-note* a few of the so-called specific remedies said to be adopted by the inhabitants of countries where the most virulent serpents abound.

VENO'SA (anc. *Venusia*), a t. of southern Italy, in the province of Basilicata, 23 m. n. of Potenza. Its castle, which gives a picturesque effect to the quarter in which it is placed, is now in ruins. The Norman abbey of the Holy Trinity, founded by the Norman, Robert Guiscard, and consecrated in 1059, though now in ruins, is imposing from its magnitude and regularity, as well as interesting from its antiquity. But the unfailing interest of Venosa arises from its being the birthplace of Horace (see HORATIUS FLACCUS). In one of the streets is a column surmounted by the bust of the poet; and many of the localities of the vicinity can be identified with the places he has immortalized. Pop. about 8000.

* Decoction of Virginian snake-root; *radix corineæ*; guaco, or the *sacra vitæ anchora*; the Tanjore pill, whose chief ingredient is arsenic. See the article SNAKE-STONES.

VENT, or **TOUCH-HOLE**. See GUN.

VENTILATION. See WARMING AND VENTILATION.

VENTIMIG'LIA, a small fortified t. of northern Italy, in the province of Porto Maurizio, stands on a promontory on the sea-shore, 17 m. n.e.n. of Nice. Besides an old cathedral, it contains the church of St. Michel, containing two Roman milestones, and inscriptions by Augustus and Antoninus Pius. The strongly fortified castle above the town, recently repaired and strengthened, is the chief stronghold between Genoa and Nice. Wines and fruits are produced. Ventimiglia, the ancient *Albium Intemelium*, was the capital of the Intemelians, a Ligurian tribe; and its possession was contested in the middle ages by the Genoese, the counts of Provence, and the dukes of Savoy. Pop. '81, 4195.

VENTNOR, the principal t. on the s. shore of the isle of Wight, 9 m. s.s.e. of Newport. It is situated amid the finest of the fine scenery of the Undercliff. Fossils are found in great quantity in the vicinity. With a fine southern exposure, and well sheltered from the n., Ventnor possesses a mild climate, suitable for various classes of invalids, and has accordingly become a favorite winter and spring resort. The town is well provided with hotels and lodging-houses. Its beach is composed of beautiful yellow shingle. With these and other recommendations, Ventnor has risen into importance within the last 30 years. Pop. '61, 3208 · '81, 5493 ; '91, 5817.

VENTRICULITES, a genus of fossil sponges, specimens of which are of frequent occurrence in cretaceous strata. They often form the nucleus around which flints are aggregated, and give their form to the flint nodules. Indeed, it is believed by some that the flints are the metamorphosed remains of this genus, and other silicious sponges. Ventriculites are sessile, and cup-shaped, gradually opening from the base upward. Twelve species have been observed.

VENTRILOQUISM, the art of producing tones and words without any motion of the mouth, and so that the hearer is induced to refer the sound to some other place. It does not depend on any peculiar structure of the organs of the voice, but upon practice and dexterity. The name is founded upon the mistaken supposition that the voice proceeds from the belly. The art of the ventriloquist consists mainly in taking a deep inhalation of breath, and then allowing it to escape slowly; the sounds of the voice being modified and muffled by means of the muscles of the upper part of the throat and of the palate. The ventriloquist avails himself at the same time of means such as are employed by sleight-of-hand performers to mislead the attention. Ventriloquism is a very ancient art; and is mentioned by Isaiah (xxix. 4). The Greeks ascribed it to the operation of demons, and called ventriloquists *engastrimanteis* (belly-seers), and also *Euryklytes* from Eurykles, a professor of the art at Athens. In modern times a Frenchman of the name of Alexandre obtained great reputation for his mimetic representations, combined with ventriloquism and sleight-of-hand; and in England, Love was long one of the most popular ventriloquists.

VENTU'RA, a co. in s. California, having the Pacific ocean for its s. boundary; traversed by the Southern Pacific railroad; area, 1682 sq. m.; pop. '90, 10,071, chiefly of American birth. Co. seat, Ventura.

VENTU'RA DE RAULICA, GIOACCHINO, 1792–1861 ; b. Palermo ; left the society of Jesuits and joined the order of Theatines; soon distinguished himself by pulpit eloquence; became general secretary of his order; subsequently censor of the press and member of the royal council of public instruction for the kingdom of Naples; distinguished himself by his funeral orations, one of which, on Pius VII., passed through 20 editions, and gained for him the name of the Italian Bossuet; was appointed general of the order of the Theatines, 1824; resided at Rome, and elected professor of law in the Roman university; published, 1828, *De Methodo Philosophandi*, which was severely attacked by his friend the abbé Lamennais. Leaving the pontifical court, he spent 10 years studying especially the Scriptures and the Christian fathers. In 1848 he was made minister plenipotentiary to the court of Rome by the popular government of Sicily; May 4, 1849, retired to Civita Vecchia. Afterward he went to Paris, where his eloquent preaching drew immense crowds. Here he published *Les femmes de l'Evangile; La raison philosophique et la raison Catholique; Essai sur l'origine des idées; Le pouvoir Christien.*

VE'NUE is the locality assigned in pleadings in various actions at law for the acts or circumstances out of which the action arises. The rule is, that the declaration or plaintiff's pleading must set forth some venue, which is usually the county where the cause of action arose; and this shows where the trial will take place, if at all. If the other party shows that it would be more convenient and less expensive to try the action elsewhere, then he may apply to the court, or a judge, to change the venue, and thus the trial may take place in a different county from that first stated.

VE'NUS, the Roman goddess of love, subsequently identified with the Greek Aphrodite (q.v.). Originally, she does not seem to have occupied a conspicuous place in the Latin religion, and scarcely, if at all, figures in the history of Rome under the kings; a circumstance that throws no inconsiderable light on the Roman character, for it may be

taken as an indication of the grave and serious disposition of the people, who highly valued matrimony and wedded joys, but cared little for the sentimental passion of love. Gradually, however, as the myth of the Trojan origin of Rome gained ground, the worship of Venus emerged into importance. Aphrodite was the mother of Æneas, and Aphrodite became Venus; Ares was Mars, and Mars was the national god of the Roman people; and as in the Greek mythology, Aphrodite was beloved of Ares, so, of course, Venus was represented as the paramour of Mars, and thus was advanced by the poets to the dignity of the divine mother of the Roman people. Several temples were erected to her in Rome at different times and under different names, and rites were celebrated in her honor during the month of April—the spring-time of the year being thought favorable to the growth of tender emotions.

The figure of Venus was a favorite subject of ancient sculptors. One of the most famous specimens extant is the "Venus de' Medici," preserved in the Uffizi gallery at Florence, and generally admitted to be the finest relic of ancient art. It was dug up in several pieces, either at the villa of Hadrian, near Tivoli, or at the portico of Octavia, in Rome, in the 17th c.; and after remaining for some time in the Medici palace in Rome (whence its name), was carried to Florence by Cosmo III. about 1680. It is a nude statue, 4 ft. 11½ in. in height, without the plinth; and from the exquisite symmetry and grace of the figure, it has become a sort of standard of excellence for the female form. The sculptor was Cleomenes, the Athenian (200 B.C). The beautiful "Venus of Milo," now in the Louvre at Paris, is so called because it was found in the island of Milo or Melos in the Archipelago. Of modern statues that by Canova is the most famous. See illus., GRECIAN SCULPTURE, vol. VII. MYTHOLOGY, vol. X.

VENUS (see PLANETS), an inferior planet whose orbit is between that of the earth and Mercury. Her mean distance from the sun is 66,134,000 miles. The eccentricity of her orbit is only 0.00686, and her greatest distance, 66,586,000 m., only exceeds her least distance by 904,000 miles. She performs her sidereal revolution in 224.7 days, in an orbit whose plane is inclined 3° 23½′ to that of the ecliptic, but her synodical revolution requires much more time, 583.92 days. Between inferior conjunctions and the next superior conjunction Venus is the morning star, and between superior conjunctions and the next inferior conjunction, she is the evening star. Her diameter is about 7,500 m.; so that her volume is about $\frac{17}{20}$ of that of the earth, and her mass is nearly $\frac{18}{20}$ of that of the earth (more correctly $\frac{177}{200}$). The great inclination of the equator of Venus to the plane of her orbit, about 50° (by some estimated to be more), and the great amount of solar heat received—about twice as much as is received by the earth—it is believed totally unfits her for human or perhaps any but the lowest animal life. A dense, cloudy atmosphere is believed to envelop her, but observations indicate that there are lofty mountains rising from her surface to a height of 20 miles. Venus, like Mercury, crosses the face of the sun, as seen from the earth, but her transits are not as frequent. They, however, possess more importance, because, from being nearer, her position on the sun's disk varies much with different points of observation, thus allowing of a method of angular measurement of her distance.

VENUS. See VENERIDÆ.

VE'NUSBERG, the name of several mountains in Germany, especially in Swabia; it appears to be met with in Italy also. It occurs for the first time, so far as is known, in a poem called the *Children of Limburg*, composed in the Netherlands about 1337 (published by Van den Bergh, Leyden, 1846); but since then it is met with frequently in the literature of the 15th and 16th centuries, and has been preserved to the present day in legends and popular songs. According to these accounts the lady Venus holds her court in the interior of such mountains, in brilliant style, with song and dance, banquets, and all kinds of revels. Persons of earthly mold now and then visit her abode (they are always represented as *descending*), and tarry longer or shorter time, some even to the day of judgment, leading a life of perpetual delight; e.g., Heinrich von Limburg, a hero of the above-mentioned romance, and the noble Tannhäuser (q.v.). Yet they usually run the risk of eternal perdition; and, therefore, the faithful Eckhart sits before the entrance of the mountain, and warns people against entering. Nor does the condition of the sojourners always present so enticing an aspect; on the contrary, there are at times heard issuing from the mountain the lamentations of the damned; and Geiler von Keisersberg makes the witches in their night-expeditions rendezvous in the Venusberg. On putting together the various traits of these traditions it is apparent that they originated in the mythology of the highest German antiquity. The lady Venus is, under a name borrowed from the classical mythology, the universal divine mother of the old German belief, in her peculiar conception of subterranean goddess—the same being that appears under several other German names, each bringing forward some particular side of her character; e.g., Hulda (q.v.), the gracious, benign; Hilda, war; Berchta (q.v.), the shining; Hel, the concealed (from which our hell is derived). In this character of goddess of the under-world she is surounded by the elves and other subterranean spirits, unbaptized children, fallen heroes, and the wise women devoted to her services, who, in the way of thinking of later times, were degraded to witches. The queen of Elfland, or Faery, is evidently only another form of the lady Venus modified by a more decided mixture of Celtic and classic elements.—See Tale of Tamlane, and Thomas the Rhymer in *Minstrelsy of the Scottish Border.*

VENUS'S FLOWER-BASKET. See ZOOPHYTE.

VENUS'S FLY-TRAP. See DIONÆA.

VENUS'S LOOKING-GLASS, *Specularia speculum*, a very pretty little annual, of the natural order *campanulaceæ*, which has long been a favorite in flower-gardens, and it is a native of corn-fields in the s. of Europe. It has brilliant blue, white, or violet-colored flowers, which fold up in a pentagonal manner toward evening.

VERA CRUZ, a maritime state of Mexico, consisting of a belt of territory about 500 m. long by 80 broad, stretching along the s.w. of the gulf of Mexico; 26,201 sq. m.; pop. '95, 855,975, chiefly creoles and Indians. The coast region, a strip about 30 m. wide, is low, level, and sandy, its most characteristic feature being its lagoons. In the s.e. corner of the state is the isthmus of Tehuantepec (q. v.). Its climate is hot and unhealthy, yellow fever prevailing from May to November. The interior slopes upward to the volcanic mountain range of the Sierra Madre by which it is traversed, culminating in the peak of Orizaba, 17,314 ft. high. It presents all varieties of climate from tropical to arctic, and a corresponding variety of vegetable products both of torrid and temperate zones. The middle region is fertile, and covered with magnificent forests and plantations of sugar, coffee, tobacco, corn, etc., and is agreeable and healthy. Among the mineral products are gold, copper, iron, and lead.

VERA CRUZ, or VILLA NUEVA DE LA VERA CRUZ (the New City of the Real Cross), an important city on the e. coast of Mexico, about 180 m. e. of the city of Mexico, with a pop., 1895, of 88,993, composed of a motley collection from many nations. The city is built in a semicircle facing the sea, and is regularly laid out; the streets, which are wider than is usual in tropical countries, running e. and w. from the harbor, with others crossing them at right angles. The town is well defended by a strong wall and other substantial works, as also by the castle of St. Juan de Ulloa, which stands upon an island of the same name, about half a mile from the shore. The principal buildings are the cathedral, and other churches, generally built in the Moorish style, several monasteries; the court-house and prison, which stand on one side of the great square in the center of the city. There are a few good hospitals. The drainage of the city flows down open channels in the center of the streets, which are almost on a level with the sea. This, combined with the wretched water which the inhabitants are compelled to use, the marshy and utterly barren nature of the surrounding country, and the pestilential nature of the climate generally, easily accounts for the frightful ravages of yellow and other fevers. Yellow fever is most prevalent from May till November. Although it is the chief port for all Mexico, Vera Cruz has no harbor, but only an open roadstead between the town and the castle. The anchorage is exceedingly bad, and when the n. gales, or *nortes* (terrible hurricanes, bearing along with them clouds of sand from the sand-hills behind the town), prevail, many vessels are wrecked on the adjoining shore. A breakwater is in process of construction, which will do much towards improving the harbor. A railway between this city and Mexico was begun in 1864, and completed in 1869. There is also to be an interoceanic line to Acapulco.

The chief exports are the precious metals, cochineal, sugar, flour, indigo, provisions, sarsaparilla, leather, vanilla, jalap, soap, logwood, and pimento; and the imports, cotton, woolen, linen, and silk goods, brandy, iron, steel, wax, quicksilver, paper, hardware and cutlery, earthenware, etc.—OLD VERA CRUZ, a village to the n., was the first Spanish settlement on the coast.

VERAGUA, DUKES OF, the title borne by the successors of Columbus, bestowed originally upon Luis Columbus the grandson of the discoverer. The male line became extinct on the death of Diego Columbus in 1578, and the succession was settled on the descendants of Diego's sister. The Duke of Veragua (b. 1837) visited the United States on the occasion of the Columbian centennial in 1892.

VERATRIA, CEVADINE, $C_{32}H_{49}NO_9$, an alkaloid occurring in cevadilla (the dried fruit of *usagræa officinalis*), in the bulbs of *colchicum autumnale*, and in the roots and seeds of different species of *veratrum*. Cevadilla is the source from which it is most readily obtained; and for the method of extracting it we must refer to the pharmacopœia. In a state of purity, it is a pale, gray, amorphous powder, without smell; but even in the most minute quantity, powerfully irritating to the nostrils, sometimes producing dangerous fits of sneezing. It is strongly and persistently bitter, and highly acrid; insoluble in water, sparingly soluble in spirit and ether, but readily in diluted acids. Heated with access of air, it melts into a yellow liquid, and at length burns away, leaving no residue. In France it is much used as an internal remedy for pneumonia and acute rheumatism, and for the latter its efficacy is well established. It is given in the form of pills, containing $\frac{1}{14}$ of a grain, of which three may at first be given daily, and the number increased up to eight or ten, unless pain in the throat or stomach, vomiting, or diarrhea supervene, when their use must be suspended till these symptoms disappear. In this country it is chiefly employed externally in the form of "ointment of veratria" for neuralgic affections, and for scrofulous diseases of the joints. It is an extremely acrid and violent poison, and must be prescribed with great care.

VERA'TRUM. See HELLEBORE.

VERAZZA'NO, Giovanni da, 1480–1527; b. Italy; of a noble family; in the service of Francis I. of France sailed on a voyage of discovery to North America in 1524. He went by way of Madeira, in command of the frigate *Dauphin,* and after weathering a great storm reached the e. coast of North America, and sailed along it from the 34th degree of latitude to Newfoundland. He discovered the continent at cape Fear or New Jersey, and is supposed to have discovered New York bay. The genuineness of a letter to Francis I., giving an account of his discoveries, has been questioned. He is said to have been put to death in Spain for piracy.

VERB (Lat. *verbum,* a word), the name given in grammar to that part of speech (see Parts of Speech) which predicates or affirms. See Sentence. As the very end of speaking is to assert or affirm something with a view to being believed or disbelieved, the part of speech which performs this office is, as it were, the soul of the sentence, and is called "the word," or verb, par excellence. Verbs affirm either some action or some state; as, "John *reads;*" "the sun *shines;*" "the book *lies* on the table." When the nature of the action requires an object to complete the sense, the verb is called *transitive,* because the action *passes over* (Lat. *transit*) to an object; as, "the child strikes *the dog.*" Some verbs complete the conception of the action in themselves, and require no complement; as, "the child *sleeps,*" "the bird *flies.*" These are called *intransitive.* A distinction is attempted to be made between intransitive verbs expressing action (as *flies, moves*), and verbs expressing merely a state (as *sleeps, lies*), the latter being called *neuter* verbs. But it is often impossible to draw the line where activity ends and neutrality begins. Even in such a verb as *sleeps,* it is implied that the sleeper shows certain outward manifestations that make an impression, or act, on the beholder; when we affirm that an object *stands, lies,* or even only *exists,* or *is,* we in fact affirm that it "acts," in this sense. All verbs, then, agree in affirming action.

Nor can any exact or permanent division be made of verbs into transitive and intransitive. We can say whether a given verb in a particular sentence is used transitively or intransitively; but not that it is absolutely, and in itself, transitive or intransitive. It would be difficult, perhaps, to find a verb that cannot be shown to be both the one and the other. "The child *sees* the candle" is unquestionably an instance of a transitive verb; in, "the newborn child *sees,* but the puppy is blind," the same verb is unquestionably intransitive. A verb used transitively has reference to particular acts; when the action is to be *generalized,* all specification of an object is dropped, and the verb becomes intransitive. Ex., "men *build* houses" (trans.); "men *build,* and time pulls down" (intrans.).

Intransitive verbs generally express a kind of action that we think of, at least, as composed of a number of parts, all like each other; as, he *walks, runs.* Now, with regard to the particular parts, we generally find that the same verb takes an object after it; as, "he walks *a step, a mile, a long way;*" "John played *a stroke, a piece, a game;* "he did not sleep a *wink*" (sleep being a prolonged winking). That any intransitive verb can take its cognate noun as an object, is a received doctrine. Ex., "he *ran* a *race;*" "they *died* an easy *death.*"

There are two classes of transitive and intransitive verbs, related to each other, in the following way:

Intransitive.	Transitive.
he sits.	he sets (causes to sit).
" lies.	" lays (" " lie).
" falls.	" fells (" " fall).
" rises.	" raises (" " rise).
" sucks.	" soaks (" " suck).
" drinks.	" drenches (" " drink).
" dives.	" dips (" " dive).

Those in the second column are called *causative* verbs. In the ancient forms of our language there were many more such causative verbs, formed from root-verbs by a change, generally of the vowel. In Hebrew every verb is capable of assuming the causative form. Modern English does not stand much on forms, but employs almost any verb in a causative sense without change of any kind. Thus, "The horse *walked*"—"the groom *walked* the horse;" the wood *floated*"—"raftsmen *floated* the wood down the stream."

Passive Form, or Voice, of Verbs.—Instead of "Cæsar *defeated* Pompey," we may say, "Pompey *was defeated* by Cæsar." In the former, the verb is in the *active voice;* in the latter, in the *passive voice.* In using the passive voice, the thing or person acted upon is made the subject of the sentence, and has the chief attention directed thereto; with the active voice, the doer and his action are more prominent. Of course it is only transitive verbs that can thus have a passive voice.

One class of intransitive verbs become transitive by the addition of one of the class of words called prepositions; as, *speak—speak to; fall—fall upon.* Some verbs already transitive take prepositions simply to modify the sense: as, *set—set up, break—break down.* In such cases, the verb and preposition are to be considered as forming one compound verb, and might be written with a hyphen—speak-to, break-down. With the

addition of a preposition, what was an intransitive verb becomes capable of being used in the passive voice. Thus, "the king spoke to the duke about it"—"the duke was spoken to about it by the king." "Robbers fell upon him"—"he was fallen upon by robbers."

Not, however, in all cases. For, "the Hudson runs into the sea," we could not say, "the sea is run into by the Hudson." And yet, with this same verb, we can say, "the mail-train was run into by the express." The distinction seems to be that when we think of the object as sensibly affected by the action, and wish to call the chief attention to the effect so produced, the object may become the subject, and the verb be passive.

VERBENA'CEÆ, a natural order of exogenous plants, consisting chiefly of trees and shrubs, but partly also of herbaceous plants. The leaves are generally opposite and simple, and have no stipules. The flowers are generally in corymbs or spikes; the calyx is tubular, persistent, inferior; the corolla hypogynous, tubular, its limb usually irregular; the stamens generally four, two long and two short, sometimes equal, sometimes only two; the ovary 2 to 4 celled, the style solitary, terminal; the fruit composed of 2 to 4 achœnia united, sometimes fleshy; the seeds 1 to 4. The order contains almost 800 known species, chiefly tropical, some of them natives of temperate countries. The verbenaceæ are allied to *labiatæ* both in botanical characters and in properties, but the leaves have no oil-glands. Some are beautiful ornaments of flower-gardens and hot-houses; some are highly esteemed for their fragrance; some are used in medicine, as vervain (q.v.), etc., although no medicinal plant of much value belongs to the order; the fruit of some species, as *premna esculenta* and species of *lantana*, is eaten; the leaves of *stachytarpheta jamaicensis* are used as a substitute for tea; and the timber of a number of species is valuable. To this order belongs the teak (q.v.) of India.

VERBOECK'HOVEN, Eugene Joseph, b. Waerten, West Flanders, 1798; a Belgian animal-painter of repute, several of whose works are in the United States. Among these may be cited his "Herd of Sheep overtaken by a Storm," "Horses attacked by Wolves," "Herd of cattle in the Roman Campagna." He was further known by his etchings and sculptures. He d. 1881.

VERCEL'LI, a venerable city of northern Italy, in the province of Novara, stands in a fertile plain, on the right bank of the Sesia, 44 m. w.s.w. of Milan by railway. It covers a wide area, is surrounded by boulevards—those on the n.w. side commanding a magnificent view of the Alps—is the seat of a bishop, and has the appearance of great prosperity. The cathedral, an edifice of about the middle of the 16th c., has a library containing a collection of ancient and valuable MSS. Vercelli is a thriving commercial city. Pop. '81, 20,165.

VERCHÈRES, a co. in s.w. Quebec, having the St. Lawrence river on the w. and n., and on the e. the river Richelieu; 195 sq. m.; pop. '91, 12,257. Co. seat, Verchères.

VERDE-ANTIQUE, a beautiful stone of a dark-green color, with patches of white, and sometimes also black and red. It is a kind of hard breccia, and was much prized by the ancient Romans, and is still in great favor in Italy.

VERDEN, a t. of Prussia, once capital of a duchy, in Hanover, on the right bank of the Aller, 3 m. from the confluence with the Weser, and on the railway to Hanover, from which it is distant n.n.w. 54 miles. Pop. '90, 8719.

VERDI, Giuseppe, composer, b. in Le Roncole, near Busseto, Parma, Oct. 9, 1813. His parents kept a small inn at Le Roncole and a little provision shop. At an early age he showed musical talent, and his father gave him a spinet and had him taught music. He was organist in his native town at the age of ten, and was aided by a prosperous grocer Barezzi, a friend of his father, who was a leader of music in Busseto. He made up a purse and sent him to Milan, but Verdi was refused admission at the Conservatorio on the ground that he had little talent. He took private lessons with Lavigna of the La Scala. In 1833 he was called to Busseto to become organist and maestro di cappella at the cathedral and conductor of the Società Filharmonica. The cathedral refused to give him the post, which enraged the Filharmonica to such an extent the orchestra refused to play for the church. This led to riots and the temporary suppression of the society. In 1836 Verdi married Marghenta Barezzi, the daughter of his benefactor, and in 1838 they went to Milan to try to have an opera represented. In 1839 *Oberto* was brought out at La Scala with success, and in 1842 his *Nabucco* gave him reputation. A list of fiascos followed until *Rigoletto* ushered in his day of fame. Verdi's style is careless, but he possesses the true gift of melody. His instrumentation is thin, and his harmony poor. It is probably his passionate warmth and dramatic power that have rendered him so popular. His *Trovatore* and *Traviata* are known all over the world, but his best work is *Aïda*, written for the Khédive of Egypt and represented in Cairo in 1871. In this opera he changed his old simple style for one more studied and more artistic. He wrote twenty-eight operas, the best known of which are: *Nabucco*, Milan, 1842; *I Lombardi, alla prima crociata*, 1843, revised as *Jerúsalem*, Paris, 1847; *Ernani*, Venice, 1844; *I due Foscari*, Rome, 1844; *Giovanna d'Arco*, Milan, 1845; *Macbeth*, Florence, 1847; *I Masnadieri*, London, 1847; *Luisa Miller*, Naples, 1849; *Il Trovatore*, Rome, 1853; *La Traviata*, Venice, 1853; *Des Vêpres Siciliennes*, Paris, 1855; *Simone Boccanegra*, Venice, 1857; *Un ballo in maschera*, Rome, 1859; *Don*

Carlos, Paris, 1867; *Aïda*, Cairo, 1871; *Otello*, Milan, 1887, and *Falstaff*, Milan, 1893. His other works are cantatas and church music, including the celebrated *Manzoni Requiem*, performed in the church of San Marco, Milan, on the anniversary of Alessandro Manzoni's death, May 22, 1874; pianoforte and chamber music; and romanze for voice with pianoforte. On the production of *Falstaff*, the king of Italy created Verdi marchese of Busseto. In 1896 Verdi gave 1,000,000 lire ($200,000) to found a home for musical artists in Milan. See Pougin, *Verdi, souvenirs anecdotiques* (English translation by James E. Matthews, London, 1887); and Blanche Roosevelt, *Verdi*, Milan, and *Otello*, (London, 1887).

VERDICT, in law, is the finding of a jury as to the issue of fact raised between the parties. The usual verdict in criminal cases is guilty or not guilty; in civil cases, it is a verdict for the plaintiff or for the defendant, according to the fact. These are called general verdicts. In some civil cases, the jury, when doubtful, or when the court directing them is doubtful how the law ought to be applied to the facts, find a special verdict, i.e., specific facts, leaving the court to draw the proper conclusion. A verdict by a jury is usually conclusive in all criminal cases, and no new trial can be had; but in civil cases, the party defeated may, within a certain number of days allowed by the practice of the court, move to set the verdict aside, and apply for a new trial on various grounds; as, for example, that the judge misdirected or misled the jury; that the verdict was against the weight of evidence, or was perverse, etc. See Not Proven.

VERDIGRIS is the popular name for basic copper acetate, $(C_2H_3O_2)_2Cu_2O+6H_2O$, a substance which is largely used for commercial purposes, and as an external application in surgery. It is prepared on a large scale by piling up copper-plates with alternate layers of marc or fermenting grape-skins. In the course of a few weeks, the surface of the copper is covered with a crust of the salt, which is detached, made into a thick paste with vinegar, and pressed into molds. The salt thus obtained is in the form of a bluish-green tough mass, which is not easily pulverized. The formation of the salt by this process is due to the alcohol in the grape-skins being slowly oxidized into acetic acid, while the copper absorbs oxygen from the air, and the oxide thus formed unites with the acetic acid. Verdigris may be obtained more directly by placing the copper sheets in cloths dipped in vinegar. Verdigris is permanent in the air; when heated, it first loses water, and then acetic acid, the residue being metallic copper. Water resolves it into an insoluble tribasic acetate, and a soluble subsesquiacetate of copper—a point which must be recollected in employing this salt. It is used by the surgeon as a caustic application to venereal warts and fungous growths ; it is also a good application in ophthalmia tarsi, and has been of much service in stimulating old and indolent ulcers, in the ulcerated sore throat of scarlatina, and in malignant ulcer of the tongue. It may be used in the form of an ointment or a liniment. The latter, formerly known as *mel Ægyptiacum*, is composed of 1 ounce of powdered verdigris, 7 ounces of vinegar, and 14 of honey. The verdigris is dissolved in the vinegar, and to the strained solution the honey is added, and the whole is boiled to a proper consistence. It should be applied with a camel-hair pencil.

Verdigris is an active irritant poison, but is much more commonly the source of accidental than intentional poisoning, it being often formed in copper vessels used for cooking, or in the very reprehensible practice of putting copper coins into pickles to give them a fine green color. If copper vessels for cooking are kept perfectly clean, they seem not to be dangerous, provided (1) no acid matter be placed in them; (2) that the boiled materials are at once poured out, and not allowed to stand to cool in them ; and (3) that the vessels are always at once cleaned. But the interior of such vessels should always be tinned, care being frequently taken that the tinning remains entire. In cases of poisoning the best treatment consists in the free administration of white of eggs and milk.

VERDITER, a pigment which is extensively used in common painting. It is either blue or green, the latter being generally known as Bremen green. It is formed by a very complicated process from blue vitriol, or sulphate of copper, sea-salt metallic copper, muriatic acid, caustic potash, and water, and occupies three months in its manufacture. The blue is most valued.

VERDOY, in heraldry, a term indicating that a bordure is charged with flowers, leaves, or vegetable charges. Thus, a bordure argent verdoy of oak-leaves proper is equivalent to a bordure argent, charged with eight oak-leaves proper.

VERDUN, (anct. *Verodunum*), a fortified t. of France, in the dep. of Meuse, stands on the right bank of the Meuse, 174 miles (direct line) e.n.e. of Paris. It was fortified by Vauban, and its defenses consist of a wall with bastions and a citadel. It is the seat of a bishop, has a fine cathedral, and carries on various manufactures. In Nov., 1870, it was taken by the Germans, who thus established better communication between Germany and the troops before Paris. Pop. '91, 18,852.

VERE, Sir Aubrey **HUNT** de, 1788–1846, an Irish baronet, author of two dramatic poems *Julian the Apostate* and the *Duke of Mercia*, as also of *A Song of Faith, and other Poems.*

VERE, Aubrey Thomas de. See De Vere.

VERE, DE, a noble family of England, of which the most distinguished members were: JOHN, 1450–1513, 13th earl of Oxford, who fought as a Lancastrian in the "wars of the Roses," had a command under Henry VII. at Bosworth, and as lord high steward pronounced sentence on the earl of Warwick: EDWARD, 17th earl of Oxford, 1540–1604, an Elizabethan poet and wit of fashion; sat on the trials of the earls of Essex, Arundel, and Southampton, and that of Mary, queen of Scots, as lord high chamberlain; and held a command in the fleet sent out in 1588 against the Spanish Armada: AUBREY, 20th earl, who fought as a royalist in the rebellion, was lord lieut. of Essex under Charles II., and was dismissed by James II. in 1687 for refusing to aid that monarch in his schemes.

VERESTCHAGIN, VASILI, was born in the province of Novgorod, in 1842, of a well-to-do family of land owners. He wished to be an artist; his father wished him to be an officer of marines. He became both, passing his work-hours at the naval school and his play-hours at a school of design. He left the naval school as first scholar, and eventually won a silver medal at the Academy of Fine Arts. He remained in the navy but a short time, leaving it at twenty to devote himself to Art. He first traveled to Paris and the Pyrenees and finally to the Caucasus, pen and pencil in hand. In 1864 he set out for Paris with his sketches to be worked up. He had had considerable indiscriminate practice in rendering what he saw, and he exhibited the most downright sincerity in his way of looking at it. He went to the great Gérôme and told him he wished to study with him or with nobody, and was admitted to his studio. He was an industrious worker, but liked to work in his own way, playing truant from the antique to nature, and from marble to flesh and blood. His instinct was to wander away from the beaten track in search of subjects, passing his vacations in the far east of Europe, or even in Persia, among those ragged races not yet known to Art. In 1867 Gen. Kauffman, who was going into Central Asia to punish the Turkomans, invited Verestchagin to join him as an Art volunteer. It pleased him, and he started, entering Samarcand with the victorious host. Both sides fought like demons, and the artist sketched. He was in a new realm of the picturesque in nature, and he found abounding wealth in character there. Dervishes, politicians, falcon hunters, soldiers in all their brutality, dirt, ignorance, and laziness. Verestchagin's principal characteristic is his individuality. He seems to be impressed, at once, with the strongest points of his subject, and in the human face seizes the innermost meaning, which he places upon the canvas with intense reverence. As a colorist he is inclined to strong contrasts, and here he shows somewhat the influence of Munich, where he has painted a great deal. In 1873 he started for British India, where he found an extraordinary field, which has been left long unexplored by artists. Color, costume, architecture, variety of type are here, and yet for centuries men have found nothing newer to paint than Italy and Spain. His Indian pictures are remarkable, but scarcely equal to those of Central Asia. The most comprehensive of these is "The Future Emperor of India," representing the Prince of Wales entering Jeypore on a richly caparisoned elephant, followed by a long procession of lesser magnates. "The Chief Mosque in Futtehpore Sikri," with worshipers, exhibits much sentiment and an astonishing mastery of *technique*. On his return from India he turned his attention to the Russo-Turkish war. He followed the armies and saw it all, a civilian in name, but a soldier still. He shipped on board one of the torpedo boats and stole up to a Turkish craft, but was wounded and lay between life and death for weeks. He recovered in time to see and paint Shipka and the final rush on Constantinople. There is a world-wide difference between his war pictures and those of the earlier Frenchmen, with their pretty uniforms and prancing steeds; truth in all its bloody aspects stares at us from his canvases and deeply impresses the horrors of war. In the fall of 1888 Verestchagin visited the United States and exhibited 131 of his best works, besides sketches and many curiosities of Russia and India. At certain hours he received in a quaintly decorated apartment, amid his glowing canvases, those of his admirers who desired to see him. Perhaps the three most impressive of his pictures represent the different methods of capital punishment: in ancient Rome, "Crucifixion;" in British India, "Blowing from Guns;" and in Russia, "Hanging." One of the most spirited war pictures is "Skobeleff at Shipka." It is the day after the battle, when Skobeleff reviews his troops while yet the dead lie in heaps around, and putting spurs to his horse gallops down the line, waving his cap and thanking his soldiers for the victory. Among others are, "The Emperor Alexander II. before Plevna," "The Conquered," in their graves, and "All Quiet at Shipka." Some of his sacred subjects are particularly touching—"Solomon's Wall," "Christ on the Sea of Tiberius," "Jesus in the Desert," and "The Prophecy."

VERGA, GIOVANNI, a distinguished Italian novelist and dramatic writer, born at Catania, Sicily, in 1840. His earliest effort, *Una Peccatrice*, passed unnoticed, but *Eva* and *Storia di Una Capinera*, which followed, psychological studies of deep insight, established his reputation. *Tigre Reale*, *Il Marito di Elena*, and *Eros* followed at short intervals; but it was not until the publication of *Nedda* and *Vita dei Campi*,—a series of masterful sketches, dealing with the passions and privations of the Sicilian peasantry,—that he struck his true vein. Two of these sketches he has since dramatized, *La Lupa* and *Cavalleria Rusticana*, the latter rendered doubly famous by the acting of Eleanora

Duse, and the music of Mascagni. Verga's latest and strongest novels are *I Malavoglia* and *Maestro Don Gesualdo*, forming the opening volumes of a series of Sicilian Stories, under the general title of *I Vinti* (*the Vanquished*). With his fellow-townsman Capuana, Verga stands at the head of the Italian "verists," and his manner has frequently been compared to that of Zola.

VERGENNES', a city in Addison co., Vt.; on Otter creek and the Central Vermont railroad; 7 miles from lake Champlain, 21 miles s. of Burlington. It contains the Vermont state reform school, graded and parochial schools, public library, electric light plant, several hotels, national banks, and manufactories of curtain and shade rollers, nails, road machines, furniture, sashes, doors, and blinds, and granite work. It affords fine views of the Adirondack and Green mountains, has steamboat communication with the lake ports, and was the building and fitting-out place of the fleet with which Capt. MacDonough captured the British squadron off Plattsburg in 1814. The creek at this point is 500 feet wide and has a fall of over 30 feet, furnishing excellent power for manufacturing. Pop. '90, 1773.

VERGENNES', Charles Gravier, Comte de, 1719–87; b. France; minister to the electorate of Treves in 1750. He was ambassador to Turkey, 1754–68; afterwards to Sweden. He was made minister of foreign affairs by Louis XVI. in 1774, after taking an active part in bringing about the revolution in Sweden. During his administration were signed the treaty with the United States in 1778, and with England, closing the revolutionary war, in 1783.

VERGIL, Polydore, abt. 1470–abt. 1555; b. Urbino; a prolific author, his best known work being *Historia Anglica*, a history of England from the earliest times to the end of the reign of Henry VII. Sent to England as collector of Peter's pence (of which office he was the last holder), he remained in that country during the most of the remainder of his life, receiving successively the rectorship of Church-Langton, the archdeaconry of Wells, and prebends in the cathedrals of Hereford, Lincoln, and St. Paul's, London. After a residence of nearly 50 years in England he returned to end his days in his native land with permission to hold his archdeaconry, as also his Hereford prebend. His Latin style is admired for its neatness and lucidity.

VERGNIAUD, Pierre Victurnien, 1759–93; b. Limoges, France. He was the most eloquent member of the *Gironde*, and in 1791 was elected to the legislative assembly and became a leader of the *Gironde*. In the national convention he was raised to the presidency, in which capacity it fell to him to pronounce sentence on the king. He was a keen opponent of Robespierre and the Montagnards, and in 1793 was, with the other prominent members of his party, brought before the revolutionary tribunal, and sentenced to death Oct. 30, which sentence was executed next day.

VERIFICATION, in law, a legal term used in pleading by a party setting forth that he stands ready to establish the truth of those facts to which he has pleaded, if they be such as amount to "new matter," the form being "and this he stands ready to verify." The practice of equity and of the civil codes of some states requires a plea to be verified by appended affidavit.

VERJUICE, a vinegar formerly much used, made from sour cider, or from the juice of the wild crab. The expressed juice of unripe grapes is another kind of verjuice used in the vine districts. Both are occasionally employed in cooking.

VERLAINE, Paul. See Symbolism.

VERME'JO, or *Bermejo*, an important affluent of the Paraguay (q.v.).

VERMES (Lat. worms), the name given by Linnæus to one of the classes in his zoological system, in which he included all the lower invertebrate animals, whether of worm-like form or not. The study of their structure has since led to their arrangement in several distinct classes, and the Linnæan term is altogether disused.

VERMICULATION, checkering or chanceling formed in mason-work as an ornament, giving the appearance of being eaten by worms.

VERMIFORM APPENDIX, a long, narrow, worm-shaped portion of gut about the diameter of a good-sized goose quill, or larger, and varying in length from three to six inches. It springs from the posterior and inner aspect of the first portion of the large intestine, near its lower end.

It is the rudiment of a lengthened cæcum found in all mammals excepting some of the higher apes and the wombat, in which the appendix exists. A brief review of the main facts concerning the development of the first portion of the large intestine, seems essential to a fair understanding of the anatomy of the vermiform appendix.

In the fœtus we find the cæcum, or blind extremity of the first portion of large intestine, represented by an elongated, fusiform diverticulum. At birth this has become a long, coiled, conical tube, tapering to a point. Very early this begins to dilate throughout its greater portion, and to become expanded into pouches or *haustra*, which give to the large intestine its characteristic sacculated shape. The original fusiform fundus of the tube, however, does not dilate, but remains small, contracted, and rudimentary; and, in the fully developed condition of the alimentary canal, appears as a mere appendix to the bulging sacculated portion above, to which alone is given the name cæcum.

The appendix vermiformis, therefore, is the terminal portion of the primitive cæcum, which never dilates.

In structure it resembles closely that of the large gut. It is hollow to its tip, and its cavity communicates with that of the large bowel. Its walls are composed of muscular, elastic, and areolar tissue, and its mucous lining is similar to and continuous with the mucous membrane lining the cæcum. It is entirely covered by peritoneum, being frequently attached by a fold of this membrane to the back of the large intestine. Its functions are probably unimportant.

Situated in the right side of the abdominal cavity, in the part described as the right iliac region, it hangs suspended, as it were, from the large gut and after describing a few slight turns terminates in a blunt end. It normally projects in a direction upward and inward, and is discovered by lifting up the extremity of the large bowel. It is subject to many variations, however, as to length and position, and its anatomical relations are of the greatest importance. Sometimes it is greatly elongated and projects far out into the peritoneal cavity ; sometimes it is found bound down by adhesions to comparatively distant points, and sometimes it hangs down into the cavity of the true pelvis in close relation to the bladder and other pelvic viscera.

The appendix is not uncommonly the seat of inflammation, perforation, and abscess caused by the lodgment of foreign bodies or hard fecal concretions (see PERITYPHLITIS). Such inflammations are responsible for a large number of cases of peritonitis in youth and adult life. The appendix is approached surgically through the anterior wall of the abdomen, and has been removed successfully in a number of cases of abscess and in recurrent attacks of Appendicitis.

VERMIFUGES, VERMICIDES, or ANTHELMINTICS, are remedies which possess the property of destroying intestinal worms, or of expelling them from the digestive canal. The only worms whose presence in the intestinal canal is so common, that the remedies for their destruction and expulsion require special notice, are the two varieties of tapeworm known as *tænia solium* and *tænia mediocanellata*, or the *hooked* and the *hookless tapeworm* (q.v.), the *ascaris lumbricoides* or *large round worm*, and the *ascaris* or *oxyuris vermicularis*, or *small threadworm*. A few of this class of medicines are said to be useful in destroying all these kinds of worms—viz., the tapeworms, the round worms, and the threadworms. In this category, we may place *absinthium*, or *wormwood*, whose effects are doubtful; *sabadilla*, or *cevadilla; santonica*, or *worm-seed*, and its active principle, *santonine* (q.v.); and *oil of turpentine*. As in our notices of the different human entozoa, we have referred to this article for the appropriate treatment of each, we will commence, in consequence of its greater importance, with the remedies that have been recommended in tapeworm, ranging them according to the repute in which they stand. (1) The root of the male-shield-fern (*aspidium filix mas*), of which the best preparation is the "liquid extract of fern-root" of the *Pharm. Br.* It may be taken in the morning before breakfast, in doses of about a scruple, in the form of an emulsion with yelk of egg, syrup of orange-peel, and water; and if the worm does not come away in six hours, a brisk purgative should be administered. Generally, however, it is expelled by a single dose, in the mass, and without pain or much uneasiness. (2) *Cusso* or *kousso*, the flowers of *brayera anthelmintica*, in doses of from half-an-ounce to an ounce of the flowers (infused for a quarter of an hour in ten ounces of lukewarm water and a little lemon-juice), or of four ounces of the infusion of the *Pharm. Br.*, and following in four hours, if it has not acted, by a dose of castor oil, is a safe and very sure remedy. (3) Decoction of the bark of the root of the pomegranate tree (*granati radix*). (4) Oil of turpentine (q.v.) ; and besides these, which are the best remedies, the seeds of the common pumpkin (*cucurbita pepo); kamela*, the powder adhering to the capsules of *rottlera tinctoria;* santonine, etc., have found their advocates. All these medicines should be taken fasting, or after a light supper on the previous evening.

Foremost among the remedies for *ascaris lumbricoides*, Dr. Cobbold places *santonine* (q.v.); but kamela is also very efficacious in doses of from one to two drams every four hours. Dr. Waring in his *Materia Medica* gives a long list of remedies employed with success in the east, but unknown in this country. *Ascaris vermicularis*, or the *threadworm*, is more successfully attacked locally in the rectum by injection, than by medicines administered in the ordinary method. Among the best forms of enemata are half a dram of tincture of sesquichloride of iron in a little gruel, retained in the bowel as long as possible, or injections of salt and water, or of infusion of quassia. As an internal remedy, santonine is the best. The most annoying symptom occasioned by these worms, the intense itching about the lower part of the bowel, especially in the evening and at night, is best relieved by the introduction of a little mercurial ointment within the verge of the anus when the patient retires to rest. See WORMS.

VERMIGLI, PIETRO MARTIRE (PETER MARTYR), 1500–62; b. Florence; an Italian ecclesiastic of the order of St. Augustine, whom intercourse with Valdes, a Spanish convert, and study of the works of Zwingli, Melanchthon, etc., induced to adopt the views of the reformers. Having avowed his conversion at Lucca, he was necessitated to flee thence to Switzerland, whence he passed to Strasbourg, in whose university he received the chair of divinity. Invited by Cranmer to England he was, in 1547, appointed by Edward VI. lecturer on the Scriptures at Oxford. Driven from England by the Marian

AREA AND POPULATION OF NEW HAMPSHIRE AND VERMONT BY COUNTIES.

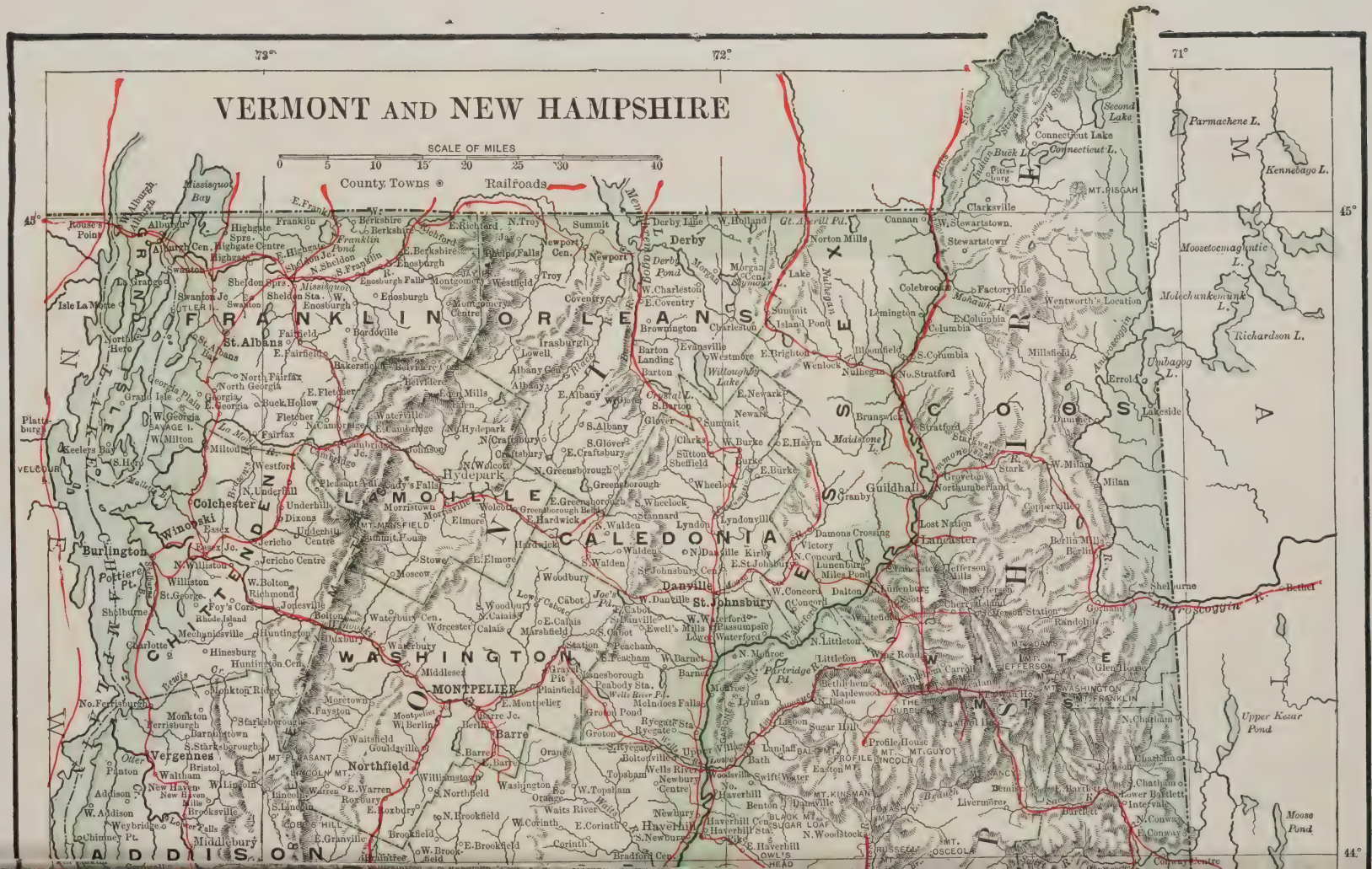
(ELEVENTH CENSUS: 1890.)

NEW HAMPSHIRE.

	Area in Square Miles.	Population.		Area in Square Miles.	Population.
Belknap	392	20,321	Merrimack	909	49,435
Carroll	907	18,124	Rockingham	709	49,650
Cheshire	784	29,579	Strafford	376	38,442
Coos	1,771	23,211	Sullivan	547	17,304
Grafton	1,766	37,217			
Hillsborough	844	93,247	Total	9,005	376,530

VERMONT.

	Area in Square Miles.	Population.		Area in Square Miles.	Population.
Addison	734	22,277	Orange	659	19,575
Bennington	680	20,448	Orleans	728	22,101
Caledonia	648	23,436	Rutland	903	45,397
Chittenden	516	35,389	Washington	703	29,606
Essex	730	9,511	Windham	765	26,547
Franklin	639	29,755	Windsor	900	31.706
Grand Isle	80	3,843			
Lamoille	450	12,831	Total	9,135	332,422


VERMONT AND NEW HAMPSHIRE
SCALE OF MILES
0 5 10 15 20 25 30 40
County Towns
Railroads
73°
72°
71°
45°
44°
FRANKLIN
ORLEANS
ESSEX
GRAND ISLE
CHITTENDEN
LAMOILLE
CALEDONIA
WASHINGTON
WINDSOR
ORANGE
WINDHAM
ADDISON
RUTLAND
WHITE
MAINE
NEW HAMPSHIRE
Lake Champlain
Connecticut R.
Connecticut Lake
Second Lake
Parmachene L.
Kennebago L.
Moosetocmaguntic L.
Molechunkemunk L.
Richardson L.
Umbagog L.
Upper Kezar Pond
Moose Pond
Lake Memphremagog
Missisquoi Bay
Rouse's Point
Isle La Motte
North Hero
Grand Isle
Plattsburg
Keelers Bay
Colchester
Burlington
Winooski
Essex Jc.
Williston
Pottiers Pt.
St. George
Shelburne
Charlotte
Hinesburg
Huntington
Huntington Cen.
Jericho
Jericho Centre
Underhill
Underhill Centre
Mt. Mansfield
Smugglers Notch
Cambridge
Johnson
Hyde Park
Morrisville
Stowe
Moscow
Waterbury
Waterbury Cen.
Duxbury
Bolton
Richmond
Jonesville
Fay's Corners
Rhode Island
Mechanicsville
Middlesex
Montpelier
Montpelier Jc.
Berlin
Barre
Barre Jc.
Graniteville
Plainfield
Moretown
Northfield
Northfield Falls
Williamstown
Orange
Washington
Waits River
Corinth
Bradford
Newbury
Wells River
Topsham
Groton
Groton Pond
Peacham
Danville
St. Johnsbury
St. Johnsbury Cen.
Lyndonville
Lyndon
Lyndon Corner
Wheelock
Sutton
Burke
Burke Hollow
Glover
Barton
Barton Landing
Orleans
Newport
Newport Cen.
Derby
Derby Line
Derby Pond
Morgan Cen.
Morgan
Charleston
Coventry
Brownington
Evansville
Westmore
Willoughby Lake
Lake Willoughby
Island Pond
Norton Mills
Canaan
Stewartstown
Colebrook
Columbia
Lemington
Averill
Averill Pd.
Beecher Falls
Canaan Sta.
Stewartstown Hollow
Factory Ville
Wentworth's Location
Millsfield
Errol
Lakeside
Dummer
Stratford
No. Stratford
Nulhegan
Maidstone L.
Maidstone
Brunswick
Bloomfield
Wenlock
Granby
Guildhall
Victory
Concord
Lunenburg
Miles Pond
Lancaster
Lost Nation
Northumberland
Groveton
Stark
Milan
Berlin Mills
Berlin
Gorham
Shelburne
Randolph
Jefferson
Jefferson Hills
Cherry Island
Jefferson Station
Whitefield
Littleton
Littleton Jc.
Wing Road
Carroll
Glen House
Bethlehem
Bethlehem Jct.
Maplewood
Twin Mt.
Mt. Washington
Mt. Franklin
Mt. Pleasant
Mt. Jefferson
Mt. Adams
Mt. Clay
The Horn
The Nubble
Mt. Lincoln
Mt. Guyot
Profile House
Profile Mt.
Eastern Mt.
Sugar Hill
Lisbon
Lisbon Sta.
Bath
Lunlaw
Ballard Mt.
Swift Water
Woodsville
Wells River Pd.
McIndoes Falls
Ryegate
Ryegate Sta.
Boltonville
Upper Waterford
Lower Waterford
Passumpsic
Passumpsic Pd.
Partridge Pd.
Monroe
N. Monroe
Lyman
Haverhill
Haverhill Cor.
Haverhill Sta.
Benton
Benton Jct.
Bath
Piermont
Orford
Fairlee
Thetford
Thetford Hill
Post Mills
Vershire
Vershire Cen.
Corinth
E. Corinth
S. Newbury
Newbury
Wells River
Topsham
Waits River
Williamstown
Orange
Washington
Northfield
Northfield Falls
Roxbury
Lincoln
Warren
E. Warren
Waitsfield
Gouldsville
Moretown
Duxbury
Waterbury
Waterbury Cen.
Worcester
Calais
E. Calais
Marshfield
Cabot
Cabot Jct.
Danville
Danville Jct.
Ewell's Mills
Peacham
Barnet
Barnet Jct.
Lanesborough
Peabody Sta.
Wells River Pd.
McIndoes Falls
Groton
Groton Pond

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persecution he resumed his chair of divinity at Strasburg, assuming also that of Aristotelian philosophy, both which he held till 1556, when he became professor of theology at Zürich. In 1561 he attended the celebrated conference of Protestant divines at Poissy, France, and died next year, much regretted, at Zurich. He was one of the most learned and most tolerant of the reformed communion. His works were published in English in 1583 under the title of the *Commonplaces of the most Famous and Renowned Divine, Doctor Peter Martyr*, dedicated to Queen Elizabeth.

VERMILION, or artificial cinnabar (q.v.), is a bisulphide of mercury, formed by mixing 100 parts of the metal with 16 parts of sulphur, and subliming them in properly constructed retorts ; the result is a heavy dull red cake, an inch or so in thickness, of acicular crystalline texture, and exactly resembling in these respects the native cinnabar. When, however, it is finely powdered, it acquires the beautiful bright red color so well known in this pigment. The finest European vermilion was, until lately, made at Utrecht in Holland, and this manufactory supplied nearly all Europe. It is now, however, manufactured in other places, particularly in Istria. A new process, invented by Kirchoff, has also been introduced, and is employed in most manufactories for making the finest quality. It is called the humid process, from the employment of water, with which the ingredients are triturated at a temperature of not more than 130° Fahr., until the mixture, which is first black, turns a brownish-red, when the temperature is lowered to 114° Fahr., and steadily maintained at that until the brightest color is obtained ; it is then allowed to subside, the liquid is decanted off, and the residue washed in clean water. The Chinese have always been famous for the extreme beauty of their vermilion.

VERMILION, a co. in e. Illinois, having the state line of Indiana for its e. boundary ; 926 sq.m. ; pop. '90, 49,905. Co. seat, Danville.

VERMILION, a co. in w. Indiana, having the Wabash river for its e. boundary ; 270 sq.m. ; pop. '90, 13,154. Co. seat, Newport.

VERMILION, a parish in s. Louisiana, having the Gulf of Mexico on the s. and Vermilion bay on the s.e., watered by the Vermilion river ; 1230 sq.m. ; pop. '90, 14,234. Parish seat, Abbeville.

VERMILYE, Thomas Edward, d.d., ll.d., b. New York, 1803 ; studied at Yale College and Princeton theological Seminary, but without graduating ; ordained by the presbytery of New York ; pastor of the Presbyterian church, Vandewater Street, New York ; of the Congregational Church, West Springfield, Mass., 1829-34 ; of a Reformed Church, Albany, N. Y., 1834–39 ; became pastor of the Collegiate Reformed Church, New York. He published an *Address* before the St. Nicholas Society of New York ; a *Discourse* on the Rev. Dr. De Witt before the New York historical society ; a bicentennial discourse in commemoration of the founding of the West Springfield church, March 25, 1874. He died March 17, 1893.

VERMIN (Lat., *vermis*, a worm), a term commonly applied to small noxious animals, particularly to those which, unless their increase is checked, are apt to become excessively numerous. Of some of the applications of this term, as to parasitic insects, it is unnecessary to say anything ; but it seems proper to notice the use made of it by farmers and gardeners, with reference to quadrupeds and birds injurious to their crops, and by gamekeepers with reference to those which are destructive to game. In the estimation of the gamekeeper all those animals are vermin which are known ever to prey upon any kind of game, or to rob the nests of game-birds. He therefore wages unceasing war against foxes, skunks, weasels, woodchucks, hawks, squirrels, ravens, crows, blackbirds, and even owls. The results are not agreeable to the farmer, as, the balance of nature being thus interfered with, animals destructive to his crops multiply without restraint, particularly rats, mice, and moles.

VERMONT (Fr., *Verd Mont*, green mountain), a New England state, and the first admitted under the federal constitution ; in lat. 42° 44′ to 45° n. ; long. 71° 30′ to 73° 26′ w. ; bounded on the n. by Quebec ; on the e. by New Hampshire, the Connecticut river separating ; on the s. by Massachusetts ; on the w. by New York, from which it is separated for 105 m. by lake Champlain ; length from n. to s., about 158 m. ; breadth from 35 to 90 m. ; land area, 9135 sq.m. ; gross area, 9565 sq.m., or 6,121,600 acres.

History.—V. was originally the hunting ground of the St. Francis, Iroquois, and other Indian tribes. In 1609 Champlain visited the country, and between 1665 and 1691 the French erected forts on Lake Champlain. In 1724 emigrants from Massachusetts built fort Dummer near the site of Brattleboro. New Hampshire laid claim to all the territory, which became known as the "New Hampshire grants," 138 township charters being granted by that colony between 1760 and 1768. New York made a similar claim, and obtaining from the king a grant of jurisdiction to the Connecticut river, attempted to eject the settlers from their farms. Under the lead of Ethan Allen (q.v.) bodies of militia were formed, known as the "Green Mountain Boys," which made effectual resistance, and entering actively into the revolutionary struggle, accomplished the capture of Fort Ticonderoga, May 10, 1775. In Sept., 1775, the towns declared the grants an independent district, voting to conform to the resolutions of the Continental Congress, and in 1776 "New Connecticut, alias Vermont," applied for admission to the confederation, but was debarred by the opposition of New York. In 1777, Jan. 15, the grants declared them-

selves to be a free and independent jurisdiction or state, and again unsuccessfully applied for admission. In June, 1777, a regiment under Seth Warner was routed at Hubbardston, but on Aug. 15 an army under Gen. Baum, detached by Burgoyne from the main army for the purpose of capturing Bennington, was defeated by Green Mountain Boys, under Gen. Stark and Col. Warner. In 1778 the first legislature of the independent commonwealth assembled. Throughout the war V. provided for her own men, and at its close redeemed her paper money at par. The V. militia under the Allens and Warner distinguished themselves in the invasion of Canada, in the retreat from Quebec, and in the battles on Lake Champlain, and the refusal of Congress to admit the claims of the spirited little state, led Ira Allen and others to listen to overtures from Great Britain ; but the legislature did not favor a return to British allegiance and nothing came of the negotiations. In 1781 Congress offered to admit V., with a smaller area than at present, but she refused, and did not enter the union until Mar. 4, 1791. In 1808 Montpelier became the permanent capital. In the war of 1812 the governor refused to call out the militia, but volunteers distinguished themselves in the battle of Plattsburg and in the naval battle on Lake Champlain. During the civil war the state furnished 33,288 troops to the union army.

Topography, Geology, etc.—The main range of the Green Mts., traversing the state in a northerly and southerly direction, forms an unbroken watershed except in the n., where the Winooski, Lamoille, and other streams flowing into Lake Champlain intersect it by their valleys. The chief summits of this range are Mt. Mansfield, 4430 ft. in its highest part, Camel's Hump, 4088 ft., and Killington Peak, 4380 ft. From the central part of the Green Mts. a branch, called the "Height of Land," trends to the n.e., and passes into Canada. The Taconic range, running nearly parallel to the Green Mts. for a considerable distance on the w., rises at Mt. Equinox to 3872 ft. Ascutney, an isolated Mt. near the Connecticut River, is 3320 ft. high. The principal affluents of the Connecticut are the Passumpsic, Wells, White, Black, West, and Deerfield rivers. The streams tributary to Lake Champlain are longer, are navigable for a few m., and some pass through deep gorges and have picturesque falls and cataracts along their courses. Among the western streams are Otter Creek, and the Battenkill and Hoosac, which flow into the Hudson. Of the total area of Lake Champlain, 500 sq.m., about $\frac{1}{8}$ lies in V. The shore line is broken by rocky headlands into deep, beautiful bays, notably those of St. Albans, Colchester, and Burlington. The northern end of the lake contains some large islands. The southern end of Lake Memphremagog lies within the state, and among smaller bodies of water are Lakes Willoughby, Dunmore, and Bombazine. Mineral springs, chiefly sulphurous, are numerous. The geological formations are chiefly azoic and silurian. The Green Mts. are composed of gneiss, with interposed talcose schist. East of that range is a bed of Devonian limestone, 20 to 30 m. long ; on the w. a great belt of quartz is covered by a bed of crystalline limestone 2000 ft. thick. Along the lake are lower silurian and primordial rocks. Laurentian rocks cover a limited area in the s.w., and granite is chiefly found in the n.e. Old sea beaches, lake and river terraces, terminal moraines, etc., make the study of geology peculiarly interesting. The whole state is covered with drift. The limestones abound in fossil shells, and skeletons of the beluga, mastodon, and mammoth have been found. The state is widely famed for its marbles, especially the white granular of Bennington and Rutland cos. Translucent white, red, green-banded, dove-colored, nearly black, verd antique, and other varieties are quarried. Purple, green, and black slates, kaoline, limestone, flagging stone, novaculite, suitable for hones and whetstones, mortar sand, arenaceous quartz sand, siliceous white sand, soapstone, roofing slate, marl, manganese, paper clay, and brick clay are abundant. A carbonaceous matter resembling coal is found at Brandon. Iron ores, especially limonite, are found in many places ; galena, silver, and zinc occur in small deposits, and gold is sometimes found in quartz veins. There are copper mines in the middle and e. parts of the state. Other mineral products are asbestos, amethysts, cyanite, feldspar, mica, chalcedony, jasper, garnets, tourmaline, and sulphur.

Fauna and Flora.—The deer, panther, wolf, wild-cat, and black bear are occasionally seen in remote districts. The red fox, red squirrel, gray squirrel, chipmunk, skunk, woodchuck, mink, porcupine, raccoon, and rabbit are common. The list of birds and wild-fowl includes 8 species of owl, 6 of thrush, 4 of swallow, 7 of fly-catcher, and 8 of starling ; the bald eagle, black hawk, loon, blue heron, plover, hooded merganser, Canada grouse, shore lark, orchard and Baltimore orioles, tanager, waxwing, rose-breasted grosbeak, bobolink, fox-sparrow, ruby-throated humming-bird, bank-swallow, logcock, red-headed and golden-winged woodpeckers. Many Canadian species visit or live in the state. In the mt. streams are found abundance of brook trout ; in the ponds, pickerel, sunfish, suckers, etc. ; and in Lake Champlain, the sturgeon, muskalonge, pickerel, pike, roach, perch, whitefish, bass, salmon-trout, and other species. Among reptiles are the rattlesnake, black snake, and several species of adder. The flora comprises nearly all the plants found in New England and in addition about 30 species not met with in other states. Out of nearly 1400 species, 1200 are flowering plants, including 100 trees and shrubs. The Green Mts. derive their name from the coniferous trees, especially spruce and pine, which cover them to the summits. The coniferæ number 16 species, 6 of which are pines and 4 spruces. The larch, white cedar, red cedar, cypress, juniper, and yew are abundant. There are 9 species of oak, 5 of maple, 2 of plum, 3 of cherry, 6 of birch, 3 of ash, 3 of elm, 3 of walnut, 15 of willow, and 5 of poplar. Other

trees are the linden, tulip, hornbeam, sassafras, and butternut. The violets number 12 species, the asters 22, the golden-rods 20, the orchids 43, the ferns 43, the sedges 88, and the grasses 91.

Climate, Soil, and Agriculture.—The climate is very healthful, although the winters are long, the snows deep, and the temperature in the inland valleys sometimes falls to 30° below zero. The mean annual temperature at Burlington is 45° F.; at Montpelier, 42.76°; av. annual rainfall is 33 ins. The soil in general is a rich loam, and is very fertile in the Connecticut valley, on the western slope of the Green mts., and along lake Champlain. The hills are well adapted for pasturage, and sheep, cattle, and horses are extensively bred for market. The sheep are of the fine-wooled merino breed, and have been extensively exported to Texas, California, Colorado, and to Australia and South America for crossing with the coarser-wooled breeds. The horses of Vermont were among the first to win fame on the race-courses of the country, and include the Morgan, Messenger, and Black Hawk stock. The agricultural products have a high rank, and the percentage of improved land in the state is exceeded only by New York and Illinois. The principal crops, according to annual value, are hay, oats, potatoes, and corn. The dairy products are also extensive, with an annual production of twenty-five million tons. The State Board of Trade was established in 1888, and one of its most important duties is to look after the interests of the farmer. Fully one-third of the maple sugar of America comes from Vermont, the annual yield exceeding $1,000,000. Hops are raised in limited quantity, and along the lake shore are fine orchards and vineyards.

Industries.—In manufactures, Vermont is far behind the other New England states, but a few of her manufactures are world-renowned. The U. S. census of 1890 reported for Vermont, 3031 manufacturing establishments, employing $32,763,291 capital and 24,894 persons, paying $10,096,549 for wages, and $20,433,174 for materials, and having a combined output valued at $38,340,066. The principal manufactures are lumber from logs and bolts, planing mill products, marble and stone work, flour and grist mill products, woolen goods, paper foundry and machine shop products, hosiery and knit goods, musical instruments, patent medicines, cotton goods, agricultural implements, leather, and boots and shoes. At St. Johnsbury are made the Fairbanks scales. The first patent was taken out in 1831, and now more than five hundred varieties are made, ranging from the most delicate balances to the immense railway scales weighing 150 tons at once. The famous Estey organ works, established in 1846, are located at Brattleboro. Burlington is one of the largest lumber markets in America. St. Albans is a great market for dairy products. The first quarry in the state was opened in 1785, and now Vermont produces three-fourths the marble quarried in the United States. The first quarry in Rutland marble was opened in 1844, and now West Rutland is the chief center of the marble industry. Proctor is noted for the largest marble quarry in the world, large quantities being taken from this quarry for building purposes in numerous cities all over the country. The marble of this section is also said to be whiter and more durable than Carrara marble, which it is rapidly replacing for monumental purposes. Cavendish has quarries of fine serpentine marble; Plymouth, verde antique, equal in beauty to the Italian; Fairhaven and Castleton, slate for mantels, billiard beds, and slate pencils; Poultney and Northfield, roofing slate; and Barre, granite, remarkable for its color and texture. At Brandon are found mines of kaolin, from which fine grades of mineral paint are made.

Commerce.—Considerable foreign commerce is carried on with Canada through Burlington, which is the port of entry of the U. S. customs districts for the state. The annual value of the exports and imports exceeds $15,000,000. This commerce is carried on with Montreal, principally by the way of lake Champlain and the Richelieu river, and by means of canals, navigation is also practicable with Albany and New York. The second steamboat ever built was the *Vermont*, launched on lake Champlain in 1809, or two years later than Fulton's attempt with the *Clermont* at New York.

Banks, etc.—On Oct. 31, 1896, there were 49 national banks in operation, with capital $6,985,000, deposits $8,688,420, and reserve $2,728,297, and 40 mutual savings banks, with depositors 103,281, deposits $32,170,743, and resources $34,991,347.

Railroads.—The railroads of the state are operated chiefly by the Central of Vermont, the Boston and Maine, and the Grand Trunk railroad companies. The total length of roads exceeds 1070 miles, of which about 870 miles are local. The capital of local roads is nearly $20,000,000, funded debt $10,000,000, total investment $31,500,000, cost of roads and equipments $26,000,000, and net earnings $1,600,000.

Religious Denominations, Education, etc.—The leading denominations numerically are the Roman Catholic, Congregational, Methodist Episcopal, Baptist, Protestant Episcopal, Universalist, and Free-will Baptist. V. forms a diocese of the P. E. church, and a bishop of the R. C. church is stationed at Burlington. Education, by law of 1887, is controlled by a state superintendent elected by the legislature, a co. board, consisting of one member from every town, and a co. salaried supervisor, chosen every 2 years by the co. board of education. Free public schools are maintained by means of state and local taxes and the income of a permanent school fund. The public school population is about 82,000, enrollment, 65,000; average daily attendance, 43,000; school houses, 2500; teachers, 3800; value of school property, $2,000,000; annual expenditure nearly $1,000,000.

Among the higher institutions are normal schools at Randolph, Johnson, Castleton, and Lawrenceville; Middlebury coll. (Cong.), Middlebury; Norwich univ. (P. E.), Northfield; the Univ. of Vermont (non-sectarian), Burlington; Montpelier seminary (M. E.), Montpelier; the State Agricultural coll. at Burlington; and the Vermont Episcopal institute, also at Burlington. The libraries in the state containing over 1000 vols. are 67 in number. The state library at Montpelier contains about 32,000 vols. The number of newspapers and periodicals published in 1897 was 86.

GOVERNMENT, ETC.—The capital is Montpelier. The gov., who holds office 2 years, receives a salary of $1500; the lieut. gov. receives $6 per day; the sec. of state (elected by the legislature) and treasurer, each $1700 yearly; the auditor, $2000. The executive veto is a suspensory act merely, and subject to the action of the next legislative session. The legislature consists of 30 senators and 245 representatives, each elected for two years since 1870, and each receiving $3 per day during a session. Legislative sessions are held biennially, open on the first Wed. in Oct., and are unlimited. General elections are held biennially on the first Tuesday of Sept. The qualifications for voting are—previous residence of one year in the state and 3 mos. in the town, and 30 days in precinct. The registration of voters is required. New ballot laws based on the Australian system (q.v.) were adopted in 1890. Wilful desertion or sentence to state prison for three years, absence, unheard of for seven years, are among the causes for divorce. Parties must have lived together in the state for one year. Residence required, one year. The judiciary of the state consists of a supreme court of 7 judges, chosen by the legislature for 2 years, each receiving $3000 salary; of a chancery court, which the supreme court judges also hold; of a co. court in each co.; of justices' courts in the several towns; and of probate courts in each probate district. The constitution provides for the meeting once in 7 years of a council of censors, who propose, if they desire to do so, changes in the constitution, which are acted upon subsequently by a convention called by them. The first of these councils met in 1785, and the fifteenth in 1883. Rents and profits of a wife's real estate and the interest of her husband in it, are exempt from execution for his debts, and can only be conveyed by her joining in the will. The wife may dispose of her property by will. The legal and only rate of interest is six per cent.; the penalty for usury is forfeiture of excess of interest. Judgments outlaw in eight years; notes, if under seal, in fourteen years, otherwise six years; open accounts, in six years. The state is entitled to two representatives in congress, and four electoral votes. The electoral votes have been cast as follows: 1792, Washington and Adams, 3; 1796, Adams and Pinckney, 4; 1800, Adams and Pinckney, 4; 1804, Jefferson and Clinton, 6; 1808, Madison and Langdon, 6; 1812, Madison and Gerry, 8; 1816, Monroe and Tompkins, 8; 1820, Monroe and Tompkins, 8; 1824, John Quincy Adams and Calhoun, 7; 1828, John Quincy Adams and Rush, 7; 1832, Wirt and Ellmaker, 7; 1836, Harrison and Granger, 7; 1840, Harrison and Tyler, 7; 1844, Clay and Frelinghuysen, 6; 1848, Taylor and Fillmore, 6; 1852, Scott and Graham, 5; 1856, Fremont and Dayton, 5; 1860, Lincoln and Hamlin, 5; 1864, Lincoln and Johnson, 5; 1868, Grant and Colfax, 5; 1872, Grant and Wilson, 5; 1876, Hayes and Wheeler, 5; 1880, Garfield and Arthur, 5; 1884, Blaine and Logan, 4; 1888, Harrison and Morton, 4; 1892, Harrison and Reid, 4; 1896, McKinley and Hobart, 4. In 1896 the assessed valuations were—real property $113,700,464, personal $60,996,759—total $174,697,233; tax rate, $1 per $1000; and in 1897 the total debt was $258,443, and resources, including cash on hand, $573,938. The state institutions are the prison at Windsor, the asylum for the insane at Waterbury, the soldiers' home at Bennington, the house of correction at Rutland, and the reform school at Vergennes. There are many denominational and local institutions, nearly all well endowed, and in or near Burlington.

POPULATION.—In 1790, 85,425; 1820, 235,966; 1840, 291,948; 1860, 315,098; 1880, 332,286; 1890, 332,422. There are 14 cos.; for pop. 1890, see Census Tables, vol. XV. The largest cities, 1890, were Burlington, 14,590; Rutland, 11,760; St. Albans, 7771; Brattleboro, 6862; Barre, 6812; St. Johnsbury, 6567; Bennington, 6391; and Montpelier, 4160. See histories by Hall, Thompson, and Miss Hemenway; Thompson's *Geography and Geology of Vermont.*

VERMONT, UNIVERSITY OF, in Burlington, on lake Champlain; chartered 1791. In 1865 the legislature gave the institution the avails of the land received from congress under the act of 1862, for the purpose of promoting instruction in agriculture and the mechanic arts, and since that time it has been known as the "University of Vermont and State Agricultural College." It is under the patronage of no religious denomination. Its original endowment consists mainly of leased lands, given partly by the state and partly by individuals. It has an invested fund (including the agricultural appropriation) of $246,000, and an annual income of $68,000. The university is beautifully situated on elevated ground, commanding a magnificent view of lake Champlain and the Adirondacks on the w., and of the Green mountains on the e. It has a library of 51,000 volumes, chemical, physiological, and botanical laboratories, a museum, a cabinet of art curiosities, and a large experimental farm. It embraces departments of arts, science (including engineering), agriculture, and medicine. Women are admitted to all departments except the medical. Professors (1896) in the colleges of arts and science, 21; in the medical college, 21. Students in all departments, 1897, 537; professors and other instructors, 52. Pres., Matthew Henry Buckham, D.D.

VERNAL GRASS, SWEET, *Anthoxanthum odoratum*, a grass very common in America and throughout Europe and the northern parts of the world generally, growing in meadows, woods, and pastures. It is about a foot high, with spiked oblong panicle, the flowers remarkable as having only two stamens. See illus., GRAIN, ETC., vol. VI.

VERNATION, in botany, a term employed to designate the manner in which the leaves are arranged in the leaf-bud. It corresponds with æstivation (q.v.) in the flower-bud. There are great differences in the vernation of plants, and these differences are characteristic not only of species but of genera, and even of natural orders, but the vernation of the same species is always the same. The vernation of plants is very interesting: in some the leaves are very simply placed together; in others they are most curiously folded, rolled, or plaited, and interlaced with each other.

VERNE, JULES, b. France, 1828; studied law at Paris; brought out a comedy in 1850 called *Les Pailles Rompues*, which was followed by *Onze Jours de Siège*, and several comic operas. He is chiefly known by his "scientific romances," of which the first, *Five Weeks in a Balloon*, appeared in 1863. Among his numerous later works may be mentioned: *A Journey to the Center of the Earth* (1872); *Twenty Thousand Leagues Under the Sea* (1873); *Around the World in Eighty Days* (1874); *Michael Strogoff* (1876); *Dick Sands, the Boy Captain* (1878); *Family Without Name* (1889); *The Purchase of the North Pole* (1890); *Le Château des Carpathes* (1892), etc. His *Le Docteur Ox* has been transformed into an opera.

VERNER'S LAW. A law of phonetics, supplementary to Grimm's Law (q.v.). It explains certain phonetic changes, which under Grimm's Law have to be regarded as exceptional. It was discovered by Karl Verner of Copenhagen, in July, 1875, and was first published in 1877 in Kuhn's *Zeitschrift*, vol. XXIII., page 97. Prof. W. W. Skeat gives the following statement of it in his *Principles of English Etymology:* "If the Aryan *k*, *t*, or *p*, immediately follows the position of the accent, it shifts regularly in Low German to *h*, *th*, or *f*; but if it precedes the position of the accent, it becomes (as it were by double shifting) *g*, *d*, or *b*."

VERNET, ÉMILE-JEAN-HORACE, a celebrated French painter of battle-pieces, in whom may be said to have culminated the talent of a family through several generations distinguished in the sphere of art. His grandfather, CLAUDE JOSEPH, born in 1714, was a native of Avignon. By Antoine Vernet, his father, also a painter, Claude Joseph was early initiated in art, and going at the age of 18 to Italy, he remained there 20 years. Toward the end of that period, much of which had been passed in struggle and privation, his reputation as a landscape and marine painter had become so high that he was invited to Paris by Louis XV., who assigned him apartments in the Louvre. Between this time (1752) and his death in 1789 he painted an immense number of pictures, one of his chief undertakings being a series of large pieces commissioned by government, representing the chief seaports of France. These were 15 in number, and are still to be seen in the Louvre, with many other of his best works. During his life he was held to be, in France, without a rival in his own department; and an honorable rank continues to be assigned him among the painters of his country. He married at Rome an English lady, a Miss Parker, by whom he had a son, ANTOINE-CHARLES VERNET, born at Bordeaux in 1758, and popularly known as Carle Vernet. Carle received his education, in the first instance, from his father, and afterward at the academy of Paris, where, in 1782, he gained the chief prize, which brought with it the privilege, of which he availed himself, of studying for some years in Rome. His subsequent success in Paris was great; he achieved the highest honors of the profession, became chevalier of the order of St. Michel, as also of the legion d'honneur, and died Nov. 17, 1835. He was especially celebrated as a painter of horses; but his chief works were battle-pieces on a large scale, chiefly commemorative of the triumphs of the great emperor, and, as such, amazingly popular with the Parisian public. The principal are: "The Battle of Marengo," "The Morning of Austerlitz," "The Emperor giving orders to his Marshals," "The Bombardment of Madrid," "Battle of Rivoli," "Entrance of Napoleon into Milan," and "Battle of Wagram."

The youth of HORACE VERNET, his son (born in Paris, June 30, 1789), was passed amid the tumults and anarchy of the revolution; and his general education was as irregular and incomplete as in such an element we might suppose it; but he had in his father a capable instructor in art, the hereditary genius for which very early became noted in him. It was the wish of his father that, as he had himself done, his son should go to study at Rome; but he failed in the competition for the traveling-pension for that purpose, given by the *académie des beaux arts*, and the scheme was necessarily abandoned. Undepressed by this disappointment, the young Vernet married and commenced his independent career as a painter, being then (1809) only 20 years of age. The *rôle* which he chose was that suggested at once by the previous success of his father and the military intoxication of the Parisian public. Young as he still was, he had served for some time as a soldier, not, so far as is known, with any special distinction, yet doubtless with such practical experience of the detail of a soldier's life in the field as would be found exceedingly available in his efforts for distinction of another kind. Whereas the treatment of military subjects by his father and others had been, hitherto, more or less of the conventional and so-called imaginative kind, more properly to be called imaginary, the

new aspirant, with his fuller sympathy and knowledge, sought for his effects in that serious rendering of truth which is the basis of all authentic imagination. In the halt, the bivouac, or the battle, the French soldier should be painted according to the veritable fact of the matter, as Vernet himself had seen, or could rigorously so conceive it. The success which rewarded this attempt at more earnest and truthful conception, was brilliant and instantaneous, his very first pictures of the kind—"The Dog of the Regiment and the Horse of the Trumpet," "Capture of the Redoubt," "Halt of French Soldiers," etc.—being received with an enthusiasm of favor accorded to those of no other artist. In 1812, to confirm this popular approval, the first-class medal was awarded to him; and in 1814 he had the title conferred on him, by the emperor, of chevalier of the legion d'honneur. The unrivaled popularity which he had thus at a bound achieved ever afterward remained with him; and the favor which he enjoyed from the emperor, whose victories he signalized on his canvas, was continued to him by the restored dynasty, whose sympathy with these favorite subjects, which, as occasion served, he continued as before to paint, could only be supposed imperfect. By Charles X. he was, in 1825, made officer of the legion d'honneur; and in the next year he was elected member of the Institute. In 1827 he was appointed director of the French academy at Rome, whither he went to reside. He remained there for several years; and on the withdrawal of the French legation, occasioned by the revolution of 1830, he was appointed to act as representative of his country at the Roman court.

With Louis Philippe, the services of Vernet were in especial request; and one of his most gigantic undertakings, the grand series of paintings in the Constantine gallery at Versailles, commemorative of the triumphs of the French arms in Algeria, was a task prescribed him by that monarch. In pursuance of this object he more than once visited Algeria; as, indeed, throughout his career he frequently became a traveler on similar professional errands. To the last, honors continued to flow upon him. In 1842 he was made commander of the legion d'honneur; and in the universal exposition of 1855 the grand medal of honor was awarded to him. He died Jan. 17, 1863. He left behind him no children; his only daughter, wife of the celebrated Paul Delaroche, having died in 1845.

Though he by no means exclusively confined himself to military subjects, as witness his well-known "School of Raphael," "Judith and Holofernes," and many others, it is on his consummate treatment of these that his fame mainly rests; and in this particular department, though he has many worthy competitors among his countrymen, no one of them can be said to equal him. With the utmost skill in effective composition, he combines in these works a surprising dash, vigor, and truthfulness; the movement and veritable fiery life of conflict is expressed in them with amazing effect. In the London international exhibition of 1862 some good specimens were exhibited.

VERNIER, a scale, by which linear or angular magnitude can be read off with a much greater degree of accuracy than is possible by mere mechanical division and subdivision, derives its name from its inventor, Pierre Vernier, "capitaine et chastellaine pour sa majesté au chasteau Dornans," who gave a description of it in a tract published at Brussels in 1631. The principle of this invention is essentially as follows: AB (fig. 1) is a portion of the graduated scale of an instrument showing divisions and subdivisions; *ab*, a small scale (called the *vernier*), made to slide along the edge of the other, and so divided that *ten* of its subdivisions are equal to *eleven* of the smallest divisions of the scale AB; then each division of the vernier is equivalent to $1\frac{1}{10}$ of a subdivision of AB; and consequently, if the zero-point of the vernier be (fig. 1, A) opposite 11 on AB, the 1 on the vernier is at $9\frac{9}{10}$ ($1\frac{1}{10}$ below 11), 2 on vernier is at $8\frac{8}{10}$ ($2\frac{2}{10}$ below 11), etc. Also, if the vernier be slid along so that 1 on it coincides with a division on the scale, then 0 on the vernier is *one* tenth above the next division on the scale; if 4 on the vernier coincide with a division on the scale, the 0 of the vernier is *four* tenths above a division. The vernier is applied to instruments by being carried at the extremity of the index limb, the zero on the vernier being taken as the index-point; and when the reading off is to be performed, the position of the zero-point, with reference to the divisions of the scale, gives the result as correctly as the mechanical graduation by itself permits, and the number of the division of the vernier which coincides with a division of the scale supplements this result by the addition of a fractional part of the smallest subdivision of the scale. Thus (fig. 1, B), suppose the scale-divisions to be degrees, then the reading by the graduation alone gives only a result between 15° and 16°; but as the 2d division of the vernier coincides with a graduation on the scale, it follows that the zero-point is $\frac{2}{10}$ of a division above 15°, and that, therefore, the correct reading is 15.2°. It will be at once seen that by merely increasing the size of the vernier, as, for example, making 20 divisions of it coincide with 21 on the scale, the latter may be read off to twentieths; and a still greater increase in the size of the vernier would secure further accuracy.

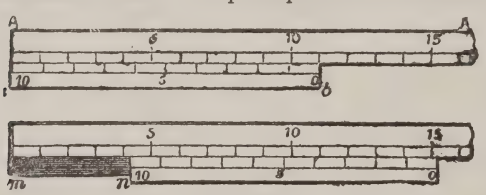


Fig. 1.

The above is the vernier as proposed by its inventor, and as it was employed for long after his time; but in the more recently constructed astronomical and geodesical instruments a vernier is employed which has one graduation *more* (fig. 2) than the corresponding portion of the scale. A little consideration will show that the only effect of this modification is to enable the vernier to be graduated toward the same direction as the scale, and thus save a little confusion in the reading off. In small instruments, or where the utmost accuracy is required, a small magnifying lens is fixed over the vernier, to enable the observer, in cases where no two graduations coincide (which is generally the case), to estimate the amount of error introduced by assuming that the two graduations which approach nearest to coincidence actually coincide.

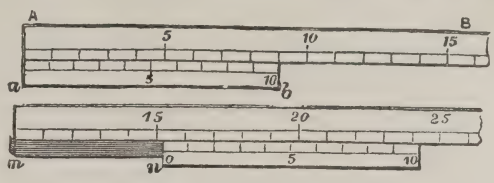


FIG. 2.

Of the various methods for subdivision which were in use before the introduction of the vernier, the most important were the *diagonal scale* (q.v.) and the *nonius*. The latter, so called from its inventor, Petrus Nonius (Pedro Nunez), a Portuguese mathematician, who described it in a treatise *De Crepusculis Olyssipone*, published in 1542, consists of 45 concentric circles described on the limb, and divided into quadrants by two diameters intersecting at right angles. The outermost of these quadrants was divided into 90, the next into 89, the third into 88, etc., and the last into 46 equal parts, giving on the whole a quadrantal division into 2,532 separate and unequal parts (amounting on an average to about 2′ intervals). The edge of the bar which carried the sights passed, when produced, through the center, and served, consequently, as an index-limb; and whichever of the 45 circles it crossed at a graduation, on that circle was the angle read off; for instance, if it cut the 7th circle from the outside at its 43d graduation, the angle was read off as $\frac{43}{44}$ of 90°, or 46° 4′ 17½″.

VERNON, a town in Tolland co., Conn., containing the city of Rockville (q.v.) and several villages. Pop. '90, 8808.

VERNON, a parish in w. Louisiana, having the Sabine river for its w. boundary, separating it from Texas; 1540 sq.m.; pop. '90, 5903. Co. seat, Leesville.

VERNON, a co. in w. Missouri, having the state line of Kansas for its w. boundary; 850 sq.m.; pop. '90, 31,505. Co. seat, Nevada.

VERNON, a co. in s.w. Wisconsin, having the Mississippi river for its w. boundary; 800 sq.m.; pop. '90, 25,111. Co. seat, Viroqua.

VERNON, a small t. of France, in the dep. of Eure, stands on the left bank of the Seine, 50 m. w.n.w. of Paris by the Havre, Rouen and Paris railway. It contains a handsome Gothic church and numerous picturesque old houses with wooden frameworks, and is the seat of some trade in grain. Pop. '91, 8288.

VERNON, EDWARD, 1684–1757, b. England; was with Hopson's expedition in 1702, and at the naval battle with the French in 1704. He became rear-admiral in 1708, and was returned to parliament in 1727. Having there declared that Porto Bello could be captured with 6 ships, he was sent out with that number of ships in 1739, and captured it with a loss of only 7 men. He was repulsed from Cartagena in 1741, and lost heavily by sickness. He was several times re-elected to parliament, and commanded on the Kent and Sussex coast in 1745.

VERNON, ROBERT, 1774–1849, born England. He acquired a fortune in mercantile pursuits, and spent large sums in collecting pictures, mostly by English artists. In 1847 he presented the more valuable part of his extensive collection to the British government. The Vernon collection includes 162 pictures, besides many busts and Gibson's group of Hylas and the nymphs. It is now in the South Kensington museum, and was formerly at Marlborough house.

VERNON-HARCOURT, LEVISON FRANCIS. See HARCOURT.

VÉRON, LOUIS DÉSIRÉ, 1798–1867; born Paris; educated at the imperial lyceum, became a physician, made a fortune by advertising a patent medicine through his connection with papers for which he wrote legitimist and ultramontane articles. In 1829 he founded the *Revue de Paris*. In 1831 he became manager of the grand opera, and brought out *Robert le Diable;* and in 1835 retired, having accumulated a considerable sum. He purchased in 1839 the *Constitutionnel*, and again made a lucky hit by publishing in it Sue's *Wandering Jew*, through which its circulation was enormously increased. He sold his paper after the *coup d'état*, supported the emperor, and became a member of the assembly. He published *Mémoires d'un Bourgeois de Paris, Quatre Ans de Règne*, and *Les Théâtres de Paris de 1806 à 1860*.

VERONA, a province of n. Italy, in the Austrian crown-land of Venice; 1061 sq. m.; estimated pop. '95, 434,325. It is bounded on the n. by the Tyrol; Vicenza and Padua on the e.; Rovigo and Mantua on the s.; Mantua and the lake of Garda on the w., the latter separating it from Brescia. Its surface is mountainous in the direction of the

Tyrol, containing Monte Baldo, 7200 ft. high, and in the s. is the great plain of the Po. It is drained by the Adige, the Tartaro or Castagnaro river, one of its branches, separating it from Mantua. The soil is fertile, producing wheat, corn, rice, potatoes, wine and fruit. Horse and cattle raising and silk-worm culture are among the industries, besides dyeing, tanning, and the manufacture of cotton and woolen fabrics, and glass. In the mountains near Verona is the village of Gargagnago, where Dante wrote part of his *Purgatorio*. Capital, Verona.

VERO'NA, an ancient and interesting city of northern Italy, in the province of the same name, stands on a plain at the foot of the hills which lie at the base of the Tyrolese mountains, 72 m. w. of Venice by railway. It stands on the Adige, by which it is divided into two unequal parts, connected by six bridges. The aspect of the town, and of the rich landscape around, is considered remarkably fine. Verona is a fortress of the first rank, a member of the famous Quadrilateral (q.v.), and has always been considered a place of strength since it was surrounded with walls by the emperor Gallienus, 265 A.D. Its modern fortifications are among the most extraordinary works of military engineering in Europe. After passing into the hands of the Austrians in 1815, it was greatly strengthened; and after 1849 they made every effort to render it impregnable. Of its many interesting edifices, the chief is the amphitheater, built, it is supposed, between the years 81 and 117 A.D. The building has been wonderfully preserved, the interior being still, to all appearance, complete. The lesser diameter of the building is 404 ft., that of the arena 156 ft.; and the edifice is calculated to have contained 22,000 people. This, as well as many of the other structures of the city, has a handsome appearance, owing to having been built of Verona marble. The Porta dei Borsari and the Arco dei Leoni are fine Roman gateways, both of the imperial age. The streets of Verona are wide, especially the Corso; there are four principal squares, of which the Piassa dei Signori contains the palace of the Della Scala and the superb Palazzo del Consiglio, the façade of which is adorned with bronze and marble statutes of celebrated natives of Verona, including Catullus, Pliny the younger, etc. The picture-gallery contains about 400 specimens, including a Madonna by Titian, and a full-length portrait and several works by Paul. Veronese. The cathedral, a Gothic structure of the 14th century, with choir and Romanesque façade of the 12th century, has a handsome porch, guarded by the celebrated paladins, Roland and Oliver. The more modern parts of the cathedral are exceedingly rich, and, among other excellent works of art, it contains a famous Assumption by Titian. Altogether, there are in Verona about 48 churches, many of them beautiful specimens of Gothic architecture, and containing valuable paintings and other art treasures. The palaces are also numerous and fine; and there are several theaters, hospitals, etc. Manufactures are not important, but there is considerable trade in silk, grain, oil and wine. Pop. of Verona (commune), '95, 73,200.

The early history of Verona is involved in obscurity, and there is some difficulty in determining whether it originally belonged to the Euganei or the Cenomani. It afterward fell into the hands of the Romans, and under the empire became one of the most flourishing cities in the n. of Italy. Constantine took it by assault in 312; Stilicho defeated the Goths here in 402. Charlemagne took possession of it, and made it the royal residence of his son, king Pepin. The Montagues, who were Ghibellines, lived here in perpetual and deadly enmity with the Guelf Capulets; and from the contentions that took place between these families, Shakespeare, drawing upon an Italian authority—has derived materials for his tragedy of *Romeo and Juliet*. In 1259 the town received Mastino della Scala as its ruler. In 1405 the city gave itself over to Venice, in order to free itself from its tyrants, who were alternately of the Scala, the Visconti, or the Carrara families. In 1866 it was ceded to Italy. See illus., VENICE, ETC.; ITALIAN ARCHITECTURE.

VERONA, a town in Oneida co., N. Y.; on Oneida lake, the Erie canal, and the New York Central and Hudson River railroad; 25 miles w. of Utica. It includes the village of Durhamville; has a high school, and nearly 20 churches; and is principally engaged in cheese-making. Pop. '90, 4535.

VERONESE, PAUL. See CAGLIARI.

VERON'ICA, the name of a supposed saint of the Roman Catholic church, whose history, and indeed whose historical existence, has been the subject of much controversy. According to the legend, Veronica was one of the women who met our Lord on his way to Calvary; and as he was sinking, overpowered by fatigue, under the weight of the cross, Veronica offered him her veil, to wipe the sweat from his brow, when, wondrous to tell, the divine features were miraculously impressed upon the cloth, and remained as a permanent picture of the face of our Lord. This miraculous picture is reported to have been preserved in Rome at St. Peter's church from about the year 700. Another, of similar appearance, is preserved at Milan; and many Catholic writers, among whom are the learned Mabillon and Papebrook, have supposed that whatever is to be said of the legend of the pious woman at Jerusalem, the name "Veronica" is but founded on an erroneous application of what in reality was meant to designate not the personage, but the picture, which was described as *vera icon* (Gr. *eikon*), "the true image" (i.e., of Christ). Other writers, however, are of opinion that Veronica is a real name, and designates a real personage, although probably erroneously applied in this legend. The picture has been frequently reproduced both in painting and engraving; the most celebrated of the former is one by the great Spanish painter Morales, surnamed "the divine"

from his favorite subject, which was the countenance of our Lord in the "Ecce Homo" and similar subjects.

VERONICA. See SPEEDWELL.

VERPLANCK, GULIAN CROMMELIN, LL.D., 1786–1870; b. New York; graduated, Columbia college, 1801; admitted to the bar; spent several years in Europe; member of the legislature, 1820, and chairman of the committee on education; professor of the evidences of Christianity in the Episcopal theological seminary, New York, 1822; member of congress, 1825–33; state senator for several years; vice-chancellor of state university; president of the New York board of emigration commissioners, 1846–61. He published, among other works, *Evidences of Revealed Religion; Essay on the Doctrines of Contracts; Addresses and Discourses;* and edited *Shakespeare's Plays* with his *Life,* 3 vols.

VER'RES, a Roman, elected pretor in 74 B.C. and by lot became *prætor urbanus.* At the expiration of his term of office he was appointed governor of Sicily, the richest province of the republic. Here he was guilty of great oppression and extortion, and at the end of his three years' administration was accused by the Sicilians. Cicero managed the prosecution, and Hortensius the defense. Cicero had prepared six orations, but at the close of the first so clear was the guilt of Verres that, without awaiting his sentence, he fled to Masilla, remaining in exile 27 years, and living in affluence on his ill-gotten gains. He perished in the proscription of Antony.

VERSAILLES, a celebrated city of France, and long the residence of the French court, (Louis XIV., XV., and XVI.), capital of the dep. of Seine-et-Oise, stands on a plain, 11 m. s.w. of Paris by railway. A fine avenue, which forms part of the road from Paris, divides the town into two parts. The town is of remarkably regular construction, consisting of long and straight streets, crossing at right angles. Versailles, a city more of pleasure than of industry,—long accustomed to find its sustenance in the expenditure of a luxurious court, and subsequently a place of residence for many foreigners attracted hither by the salubrity of the climate, the fine promenades, and the economy of living, as compared with that in Paris—has few manufactures, and little trade. It is the see of a bishop, and contains an extensive public library, many palatial edifices, public fountains, spacious squares, and elm-planted avenues; and when taste in architecture and in landscape-gardening was more formal than at the present time, the town was esteemed the handsomest in Europe. The great attraction of Versailles is its palace, and the history of this structure may be said to be the history of the town. The site occupied by the palace is known to have been that of the ancient priory of St. Julien, the chronicles of which place the date of the building in the early times of the Capetan monarchy. Later, the priory became a feudal stronghold, and its first superior, *Hugo de Versaliis,* lived in the 11th century. In 1570 the manor belonged to Martial de Léoménie, one of the victims of St. Bartholomew. The building was converted by Louis XIII. into a château; and Louis XIV. devoted enormous sums to its embellishment, or rather reconstruction. Louis XV. altered the arrangement of the interior, and meditated alterations that would have changed the whole character of the edifice, but which he was unable to carry out from want of money. Under Louis XVI., Versailles continued to be one of the usual residences of the court down to the period of the revolution, which great event had its beginning here in the meeting of the states-general, in May, 1789. Louis Philippe transformed the palace of Louis XIV. into a museum, to contain trophies of the victories of France. The approach to the palace is by the *Place d'Armes* and the *Cour d'Honneur,* in the latter of which is a large equestrian figure of Louis XIV., and other statues. The entire length of the palace is nearly 1400 feet. The collections embrace pictures of events in French history, portraits of French heroes, etc. The most interesting are the pictures of David which illustrate the career of Napoleon, and those by Horace Vernet. The gardens, with their broad terraces and long alleys, are imposing, but formal; the fountains are on the grandest scale. From the middle of Sept., 1870, till the conclusion of peace in 1871, Versailles was the center of all the operations of the Germans. On Sept. 20, king William and the crown-prince entered the town; and there, on Jan. 18, 1871, the former was proclaimed emperor of Germany. On Jan. 28, the capitulation of Paris was signed in Versailles; after the peace, it became the seat of the national assembly and government till 1880, and was the headquarters of the army during the commune. Pop. '81, 48,324; '91, 51,679.

VERSE (Lat. *versus,* from *verto,* to turn, a turning of the plow, a furrow, a row; a line in writing and in poetry), a section or group of meters written in one line. See METER, RHYME. The term verse is often erroneously applied to a group of lines or verses, which is properly a stanza. Verse is often used to signify metrical composition.

VERSECZ, a t. of Hungary in the co. Temes, situated at the foot of the Versecz mountain, 45 m. s. of Temesvár by railway. It is the seat of a Greek non-united bishop. The chief industry is the production of silk, wine, and rice. Pop. '90, 21,819.

VERSICLE (Lat. *versiculus,* a little verse), a short verse in the service, which is spoken or chanted by the priest or minister alternately with a "response" by the people.

VERSIONS. See BIBLE.

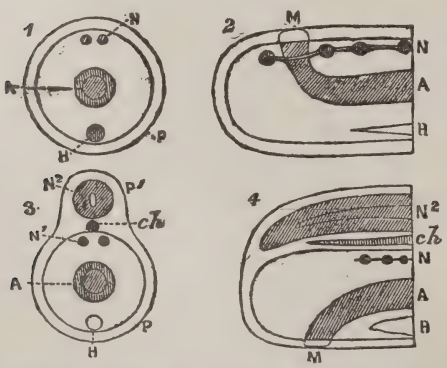
VERST, or WERST, in Russian, *versta*, an itinerary measure, equivalent to 1166⅔ yards, or about two-thirds of an English mile.

VERT. See HERALDRY.

VERTEBRÆ. See SPINAL COLUMN and SKELETON.

VERTEBRATA, the highest and most important of the animal sub-kingdoms, characterized by the universal presence of a backbone, composed of a varying number of small bones called vertebræ (see SKELETON and SPINAL COLUMN), which at once serve for the general support of the other parts, and for the protection of the central part of the nervous system (the brain and spinal cord) in a closed cavity in the interior.

We shall notice first the developmental and then the structural peculiarities of the vertebrates. Like the members of the other sub-kingdoms, the vertebrates begin in a semi-fluid nitrogenous substance called plasma, which separates itself (or differentiates, as it is scientifically termed) into albumen, fibrin, primary membrane (the lemma of Owen), nuclei, and cells, in which form, says the above-named physiologist, "the individuality of the new organism first dawns as a nucleated germ-cell, or germinal vesicle." The formation of yolk by the evolution of albuminous granules and oil-particles from the plasma, and the development of an outer layer of membrane, complete the unimpregnated egg. For further development, another principle, the spermatozoon, or product of the sperm-cell, is required. Its reception by the egg is followed by the formation of a germ-mass, which is formed by consecutive divisions, cleavages, or segmentations of the impregnated center, which incorporates more or less of the yolk. Thus far there is no difference between the vertebrate and invertebrate germ. The next step, to use the words of Professor Owen, "impresses upon the nascent being its *vertebrate* type." As has been shown in the article DEVELOPMENT OF THE EMBRYO, the parietal portion of the germ becomes raised up on each side into a ridge, so that a long groove or furrow is formed between these parallel ridges (see p. 774 in above-mentioned article); and the margins of these subsequently uniting with one another, constitute a tube, in the interior of which the vertebrate cerebro-spinal nervous centers are developed. In the mean time, the margins of the germs extend downward over the yolk till they meet and form the abdominal cavity. Hence in the vertebrates there are developed from the *chorda dorsalis*, or *notochord* (see DEVELOPMENT), "a pair of plates 'neurad,'* to inclose the nervous axis, and a pair of plates 'hæmad,'† to inclose the vascular axis and organs of vegetative life. Flesh and skin co-extend with the inclosing plates. This formation of two distinct parallel cavities—neural and hæmal—under symmetrical guidance, in the vertical or 'neuro-hæmal' direction, with a repetition of parts on the right and left sides, establishing transverse or 'bi lateral' symmetry, constitutes the chief developmental characteristics of the vertebrate animal."—Owen's *Anatomy of Vertebrates*, vol. i. p. 2. The accompanying diagrams, which we have borrowed from Professor Huxley's *Elements of Comparative Anatomy*, may tend to render this subject more intelligible. In the invertebrates, merely a single saccular or tubular investment is formed, which incloses all the viscera; so that, provided we select one high enough to possess a heart and nervous system—the transverse and longitudinal sections would be represented by 1 and 2, while P represents the parietes, or wall of the body, A the alimentary canal, M the mouth, H the heart, and N the nervous centers. "It will be observed," says Professor Huxley, "that the alimentary canal is in the middle, the principal centers of the nervous system upon one side of it, and the heart upon the other. In none of these animals, again, would you discover in the embryonic state any partition formed by the original external parietes of the body between the nervous centers and the alimentary canal."—*Op cit.*, p. 59. But the vertebrate, after it has passed through its very earliest stages of development, is, as we have seen, not a single, but a double tube; and the "two tubes are separated by a partition, which was, primatively, a part of the external parietes of the body, but which now lies in a central position between the cerebro-spinal nervous centers and the alimentary canal. Hence a transverse section of any vertebrated animal may be represented diagramatically by fig. 3, where, for the most part, the letters have the same signification as in the foregoing case, but where P′ denotes the second or cere-



Diagrams representing generalized sections of one of the higher invertebrates (1, 2) and of a vertebrate (3, 4).

1, 3, transverse; 2, 4, longitudinal section; A, alimentary canal; H, heart; P, parietes of the body; P′, parietes of neural canal; N, nervous centers of invertebrate; N′, sympathetic, and N², cerebro-spinal centers of vertebrate; *ch*, notochord; M, mouth.

* Backward in man, upward in beasts.

† Forward in man, downward in beasts.

bro-spinal tube. The visceral tube (P) contains, as in the case of the invertebrate animal, the alimentary canal, the heart, and certain nervous centers belonging to the so-called sympathetic system. This nervous system and the heart are situated upon opposite sides of the alimentary canal, the sympathetic corresponding in position and in forming a double chain of ganglia with the chief nervous centers of the invertebrata; so that the cerebro-spinal tube appears to be a superaddition—a something not represented in the invertebrate series. In close connection with the profound difference between the chief nerve-centers of the vertebrate and the invertebrate, is another remarkable structural contrast. In all the higher invertebrates, with a well-developed nervous system, the latter is perforated by the gullet, so that the mouth is situated upon the same side of the body as the principal masses of the nervous system; and some of the ganglia of the latter lie in front of, and others behind the esophagus. A longitudinal section of such an animal may therefore be represented by fig. 2. A similar section of a vertebrated animal shows, on the contrary, the chief center of the nervous system not to be perforated by the esophagus, the latter turning away from it, and opening upon the opposite side of the body (fig. 4)."—*Op. cit.*, p. 60. No structures having any analogy to the *chorda dorsalis*, or *notochord*, or to the *visceral arches* and *clefts* (see SKELETON), are to be found in the embryonic condition of any of the invertebrates.

Passing on from the developmental to the structural differences, we universally have the vertebral column and the nervous centers, consisting of brain and spinal cord; and the organs of the five senses are usually present. All possess a distinct vascular system, containing blood, with red and white corpuscles in suspension, and in all (with the solitary known exception of the *amphioxus*, or lancelet), there is a compact muscular heart of two or more cavities, and provided with valves. The breathing organ communicates with the pharynx. The alimentary canal has two apertures, usually at opposite ends of the trunk, the mouth or reception aperture never being formed of modified limbs, or working horizontally, as in the *articulata*, but provided with two bony jaws, placed one above the other, and acting vertically.

All vertebrates possess a hepatic portal system, by which the blood of the alimentary canal is collected into a portal vein which ramifies through the liver. The limbs may be totally absent, or one or two pair, never more. The muscles surround the bony levers on which they act, and thus, under the influence of the will, move the limbs and other parts. The sexes are distinct.

Comparative anatomists differ in their division of the vertebrates into classes, and as to the best basis of classification. Prof. Owen, in his *Anatomy of Vertebrates*, admits of only four classes, viz., fishes, reptiles, birds, and mammals; whereas Milne-Edwards, Huxley, and many of our leading authorities, separate the amphibians from the reptiles, and assign them a class by themselves. Prof. Owen, after describing the modifications of the piscine, reptilian, ovian, and mammalian types, observes that the vertebrates might be binarily divided into oviparous and viviparous; into anallantoic or branchiate, and allantoic or abranchiate; into *hematothermal* (Gr. *haima*, blood, *thermos*, hot) having four-chambered heart, spongy lungs, hot blood, and *hematocryal* (Gr. *haima*, blood, *cruos*, cold), having less perfect breathing organs, less complex heart, with cold blood; and adopts the latter. Huxley, on the other hand, after noticing the division of the vertebrates into *branchiate* and *abranchiate*, and pointing out the non-homogeneous character of the abranchiates—mammals being so strongly separated from birds and reptiles—suggests the removal of them to an independent position. "Thus," he observes the classes of the *vertebrata* are capable of being grouped into three provinces: (1) The ICHTHYOIDS (comprising fishes and *amphibia*), defined by the presence of branchiæ at some period of existence, the absence of an amnion, the absence of a rudimentary development of the allantois, nucleated blood corpuscle, and a parasphenoid bone in the skull; (2) the SAURIANS, defined by the absence of branchiæ at all periods of existence, the presence of a well-developed amnion and allantois, a single occipital condyle, a complex mandibular ramus, articulated to the skull by a quadrate bone, nucleated blood corpuscles, and no parasphenoid, comprising reptiles and birds: and (3) the MAMMALS, devoid of branchiæ, and with an amnion and an allantois, but with two occipital condyles, and a well-developed basi-occipital, and no parasphenoid, a simple mandibular ramus, articulated with the squamosal, and not with the quadratum, with mammary glands, and with red non-nucleated blood corpuscles."—*Op. cit.* p. 74.—For further details, the reader may consult Stannius's *Comparative Anatomy of the Vertebrata* (in German), Wagner's *Comparative Anatomy of the Vertebrata*, translated from the German by Tulk; the works of Huxley and Owen quoted in this article; and the special departments of Cuvier's *Règne Animal*, and Blanchard's *L'Organisation du Règne Animal*, Balfour's *Embryology* See ZOÖLOGY.

VERTEBRATES, ANIMAL (see VERTEBRATA). The following is a brief synoptical classification of the principal divisions of the vertebrate branch of the animal kingdom, including, with few exceptions, only classes and orders, and referring to various articles throughout this work, for a description of families, genera, and species. The vertebrate animals include only one subkingdom, *vertebrata*, which may be briefly defined as comprising animals having a body composed of a number of segments placed on a longitudinal axis, and a nervous system chiefly dorsal. A transverse and

vertical section of the body exhibits two cavities completely separated from each other by a partition. The dorsal, or cerebro-spinal nervous system, is contained in the superior or dorsal cavity; the ventral, or inferior cavity, contains the alimentary canal, the heart, and hemal system, and also a nervous system, called the sympathetic, or ganglionic, consisting usually of a double chain of ganglia, connected by nerve fibers, which also contain filaments derived from the cerebro-spinal system. During the embryonic condition of all vertebrates the center of the partition is occupied by an elongated, cellular, cylindroidal mass, called the notochord, or chorda dorsalis, which in some vertebrata continues through life; but it is usually replaced by a partly fibrous and cartilaginous, and partly bony, jointed structure, called the vertebral column. See DEVELOPMENT OF THE EMBRYO. Another characteristic of vertebrates is that the alimentary canal never penetrates or passes through any part of the nervous system as it does in invertebrates, the gullet in them passing through an œsophagal nerve collar. In all vertebrates, moreover, that part of the wall of the visceral tube or cavity which lies at the sides of, and immediately behind, the mouth, has, at a certain stage of development, a series of parallel thickenings, transverse to the axis of the body, which are called the visceral arches, and between these arches there are clefts by which the pharyngeal cavity temporarily communicates with the exterior. Nothing corresponding to these arches and clefts is found in the invertebrata. A vertebrate may have no articulated limbs, and it never has more than two pairs, which always have an internal skeleton to which the muscles are attached. Invertebrates usually have a greater number of limbs, and the muscles are attached to an exo-skeleton. All vertebrates, except the lancelet, have a single valvular heart, and a hepatic portal system, the blood from the alimentary canal being in part returned to the heart by a *portal vein* which ramifies through the liver; and there is also a peculiar system of vessels, called the *lacteal system*, which is an appendage to the venous system of blood-vessels, and consists of a series of vessels which take up the products of digestion, and while they are undergoing partial elaboration, convey them to an entrance into the venous circulation, where they mingle with the venous blood, soon to be sent to the lungs. In regard to the cerebro-spinal and sympathetic nervous systems, the former constitutes by far the greater portion, and in all except the lowest members there is a well-marked separation into spinal cord (*myelon*) and brain (*encephalon*), the proportion of one to the other differing very greatly. The nerves which arise from the cerebro-spinal axis are symmetrically disposed on the two sides of the body, and are chiefly concerned in sensation and motion, and the cerebro-spinal centers also are symmetrically formed, while the sympathetic system is more or less unsymmetrical in form and distribution, and is chiefly concerned in regulating the functions of digestion, circulation of the blood, and lymph, and, to an undetermined extent, respiration.

The cerebro-spinal system is commonly called the system of *animal* life, while the sympathetic system is called that of organic or *vegetative* life, as it has nothing to do, so far as can be ascertained, with voluntary motion. It may be remarked here, however, that the physiology of the nervous system, in some respects, is far from being perfectly understood, although almost innumerable important facts have been ascertained. Although the articulata, such as insects and crustaceans, are particularly associated with the possession of an exo-skeleton exclusive of an endo-skeleton, such as belongs to vertebrates, still many of the latter have an exo-skeleton, formed by a hardening of the outer layer of the integument. The integument is composed of two layers, an outer non-vascular *epidermis*, and a deeper vascular *dermis*, and from these may be developed an epidermal, or a dermal skeleton. The epidermal skeleton is always horny, and is represented under various forms, as in the hairs of animals, the feathers of birds, the scales of serpents and lizards, and the plates of tortoises and turtles. The dermal skeleton may be either horny or bony.

Divisions of the Vertebrata.—This great subkingdom is naturally divided into the five great classes of fishes, amphibians, reptiles, birds, and mammals, or *pisces*, *amphibia*, *reptilia*, *aves*, and *mammalia*. As has been mentioned in the preceding article, however, there are differences of opinion in regard to the relations of members of these classes, so that there is disagreement when it is undertaken to group them into larger sections. The fact that all agree in recognizing the above five divisions, while many high authorities disagree in regard to more general groupings, suggests a question as to the necessity of a more general division.

CLASS I., PISCES.—Vertebrate animals which are provided with gills throughout their whole life. The heart, when present, consists, except in *dipnoi*, of a single auricle and a single ventricle, and the blood is cold. The limbs, when present, are in the form of fins, or expansions of the integument, and there is neither an amnion nor an allantois in the embryo, unless the latter is regarded as represented by the urinary bladder. In most fishes there is a peculiar line of scales called the *lateral line*, in which each scale is perforated by a tube leading to a longitudinal canal which runs along the side of the body and is connected with cavities in the head. It has been thought that its chief office was to secrete the mucus which covers the body of the fish, but this idea is now regarded as probably erroneous, and it is generally believed that it has a function connected with the sense of touch. The osseous system in fishes varies widely. In the

lancelet the spinal cord is supported by little more than a gelatinous notochord; in others the skeleton remains cartilaginous, or it is partly cartilaginous and partly osseous, and in others it is entirely converted into bone, although the bone of fishes is unlike the bone of mammals and other vertebrates. The vertebral column of a bony fish has the following characteristics: the vertebræ of which it is composed are hollow at both ends, or *amphicœlous*, and the cup-like margins are united by ligaments, while the cavities between the vertebræ are filled with an elastic gelatinous substance, the remains of the notochord, which acts as a ball and socket joint, well adapted to the great mobility required in these animals. The kidneys are generally greatly developed, forming two elongated organs situated beneath the spinal column and extending along the whole length of the abdominal cavity. The ureters often dilate and form a kind of bladder, the doubtful representative of the allantois above mentioned. The nervous system of fishes is of an inferior type, the brain being very small and principally consisting of ganglia devoted to the special senses. The essential portion of the organ of hearing, the *labyrinth*, is present in most fishes, but there is no compartment external to this having an outer communication, and none is required, as in air breathing animals.

In regard to the divisions of the class *pisces* they are arranged, according to prof. Huxley, into six orders, the subdivisions of which are according to the classification of prof. Owen:

Order 1, *Pharyngobranchii.*—This order includes but a single species, the *amphioxus lanceolatus*, or lancelet (q.v.).

Order 2, *Marsipobranchii* (q.v.).—Body cylindrical, worm-like, and without limbs; skull cartilaginous, and having no lower jaw; notochord persistent; gills sac-like and not furnished with cilia. See Lamprey and Hag.

Order 3, *Teleostei.*—This order comprises most of those fishes which have a well-ossified endo-skeleton, and nearly corresponds to Cuvier's division of *osseous* fishes. See Teleostei; also Acanthopterygii, Alewife, Anabasidæ, Anableps, Archer-fish, Balistes, Bass (*labrax*), Bib, Blue-fish, Black-fish, Bonito, Bony-pike, Burbot, Bull-trout, Candle-fish, Carp, Climbing-perch, Clupesocidæ, Charr, Coal-fish, Chub, Cod, Cottus, Chætodontidæ, Cyprinidæ, Cyprinodontidæ, Dab, Dace, Dentex, Dory, Drum-fish, Esocidæ, Fighting-fish, Fistularidæ, Flat-fish, Flounder, Flying-fish, Gold-fish, Groundling, Gudgeon, Gymnetrus, Gymnotus, Haddock, Halibut, Holocanthus, Herring, Labridæ, Lampris, Leaping-fish, Leuciscus, Ling, Mackerel, Malacopterygii, Mango-fish, Mullet, Opah, Osphromenus, Osteoglossidæ, Ostracion, Paralepididæ, Perch, Percopsidæ, Pharyngognathi, Pike, Pike-perch, Pilchard, Pilot-fish, Pipe-fish, Plaice, Pleuronectidæ, Pogonias, Pollack, Polypterus, Remora, Roach, Rockling, Round-fish, Salmon, Salmonidæ, Saury-pike, Scabbard-fish, Scad, Scomberesocidæ, Scomberidæ, Sea-pike, Shad, Sheepshead, Siluridæ, Smelt, Sole, Sparidæ, Sphyrænidæ, Sprat, Sword-fish, Star-gazer, Tautog, Tomcod, Trout, Trunk-fish, Tunny, Turbot White-bait, White-fish, Whiting, Wolf-fish, Wrasse.

Order 4, *Ganoidei.*—This is an important order, but is represented more by extinct than by living forms, reaching far back in geological time, and furnishing many of the most interesting studies in paleontology. At the present epoch the order consists of only seven genera, viz.: 1, *lepidosteus;* 2, *polypterus;* 3, *calamoichthys;* 4, *amia;* 5, *acipenser;* 6, *scaphirhynchus;* 7, *spatularia;* all confined to the northern hemisphere, and principally to fresh water. They have the following characteristics: The endo-skeleton is only partially ossified, most of the vertebral column remaining cartilaginous during life, especially in the paleozoic forms, in which the notochord is often permanent. The skull has distinct cranial bones, and there is a lower jaw-bone. The exo-skeleton is in the form of ganoid scales (see Ganoid Fishes) or spines. There are usually two pairs of lateral fins, supported by fin rays, the first rays being generally in the form of strong spines. The pectoral arch is furnished with a clavicle, and the ventral fins are close to the anus. The caudal fin is generally unsymmetrical (heterocercal). There is always an air-bladder, which is provided with an air-duct, and is often cellular. The intestine is furnished with a spiral valve. The gills and opercular apparatus resemble those of the teleostei. The heart has one auricle and one ventricle, and the base of the branchial artery is dilated into a *bulbus arteriosus*, which is rhythmically contractile, and has a coat of striated muscular fibers and several transverse rows of valves. The most important of these characteristics is the partially ossified condition of the endo-skeleton, but which varies as to extent of ossification. In most of the older forms the notochord remains, no vertebral centra are developed, and the skull is cartilaginous and protected by ganoid plates; but even in these the outer parts of the vertebræ are often ossified. In others the vertebræ are biconcave or amphicœlous, as in teleostei. In one ganoid, however, the bony pike or *lepidosteus*, the vertebræ are opisthocœlous, or concave behind and convex in front. This is regarded as the highest point of development in the vertebral column of any fish, and as being more reptilian than piscine. The ganoid scales are composed of two layers, an inferior one of bone, and an outer one of enamel, similar to that of teeth, and called *ganoine*. The most typical form of these plates is rhomboidal, and placed edge to edge without overlapping, articulated by means of distinct processes, and forming oblique rows. Sometimes, however, the plates or scales

are circular, and overlap each other as in ordinary fishes. In the sturgeon they are detached dermal plates of true bone. Both pectoral and ventral fins are usually present, the ventrals being placed far back. In some forms the paired fins are arranged so as to form a fringe around a central lobe, and for this reason Prof. Huxley has arranged them in a distinct section called *crossopterygidæ* (fringe-finned). The same form is found in the sixth order, *dipnoi*. The caudal fin varies in form, being sometimes homocercal, and sometimes heterocercal, and therefore, in this respect, the ganoids are midway between the bony fishes (teleostei) and the sharks and rays. Like the bony fishes, the ganoids have free, pectinated gills attached to branchial arches and inclosed in a branchial chamber protected by a gill-cover, and closed by a branchiostegal membrane, usually supported by branchiostegal rays. The sturgeon (*acipenser*) and *polypterus* are furnished with spiracles on the top of the head, communicating with the mouth. The order *ganoidei* may be divided into two sections, *lepidoganoidei*, in which the body is furnished with scales of moderate size, and the endo-skeleton is more or less perfectly ossified; and *placoganoidei*, in which the skeleton is imperfectly ossified, and the head and more or less of the body are protected by large ganoid plates, often united by sutures. See Bony-pike, Cephalaspis, Polypterus, Pterichthys, and Sturgeon.

Order 5, *Elasmobranchii*.—This order is equivalent to the *selachia* of Müller, the *placoids* of Agassiz, and the *holocephali* and *plagiostomi* of Owen, and to the most typical portion of the cartilaginous fishes of Cuvier. It may be briefly defined by the following characters: The skull and lower jaw are well developed, but there are no distinct cranial bones, the skull consisting of a single cartilaginous box, without sutures; vertebral column sometimes composed of distinct vertebræ, sometimes cartilaginous. The exo-skeleton is composed of placoid granules, tubercles, or spines; two pairs of lateral fins, supported by cartilaginous fin rays, the ventral fins far back; pectoral arch has no clavicle; heart consists of one auricle and one ventricle, and a *bulbus arteriosus* rhythmically contractile and having a coat of striated muscular fibers, and several transverse rows of valves. The gills are pouch-like, differing materially from those in teleostei and ganoidei. In the sharks and rays the branchial arches are fixed, and the branchial chamber is divided into a number of distinct pouches, and each partition supports a series of branchial laminæ attached to each side like the leaves of a book. The separate pouches open into the pharynx by a separate slit, and communicate externally with the water by a separate aperture placed on each side of the neck. There is, therefore, no gill-cover and no branchiostegal membrane or rays. The elasmobranchii are divided into two sub-orders: *holocephali*, in which the mouth is terminal, and there is only a single gill-slit, and the *plagiostomi*, in which the mouth is transverse and placed on the under surface of the head, and there are several gill-slits on each side of the neck. The suborder holocephali includes several curious fishes, of which the only living forms are the chimeridæ. See Chimæra. There are several fossil representatives in the secondary and tertiary formations constituting the genera *edaphodus*, *elasmodus*, and *ischiodus*. The suborder plagiostomi includes the sharks (q.v.) and the rays (q.v.).

Order 6, *Dipnoi*.—This order includes only certain kinds of mud-fishes, *lepidosiren* and *ceratodus*, and is considered by some to be a connecting link between the fishes and the amphibia. See Lepidosiren. The lepidosiren formerly constituted the lowest order of amphibia, but most authorities now place it as the highest order among the fishes. The body is fishlike in form, the skull has distinct cranial bones and a lower jaw, and the notochord is persistent; there are no vertebral centra nor an occipital condyle. The exo-skeleton in living types is composed of overlapping cycloid scales, but the fossil forms have ganoid scales. The dipnoi resemble the amphibians in having a heart with three cavities—two auricles and one ventricle—and in having true lungs and a trachea and glottis, the blood returning to the heart by a distinct pulmonary vein.

Distribution of Fishes in Time.—The oldest representatives of fishes are ganoids, and four genera are found in the upper silurian rocks. Their maximum development was in the Devonian red-sandstone. The stureonidæ commenced their existence in the mesozoic formations (lias) and a true sturgeon, *acipenser toliapicus*, in the eocene. The elasmobranchii (sharks and rays) commenced at the close of the upper silurian in the upper Ludlow rocks. Their remains consist of spines and fin rays, from which the genus *onchus* has been established. Portions of *shagreen* have been referred to the genus *sphagodus*. The true sharks are represented in the later mesozoic deposits, but they are mostly found in the tertiary formation, several genera in the eocene. The true rays, however, are older than the true sharks, probably beginning in the carboniferous rocks. Until recently the dipnoi were not known to be represented in past time, but the triassic and Jurassic teeth upon which Agassiz founded his genus *ceratodus* are now regarded as belonging to this order. The teleost fishes first made their appearance in the cretaceous formation, toward the end of the mesozoic epoch, but after this they are the chief representatives of the whole class of fishes, and they now seem to have reached their greatest development.

Class II., Amphibia.—This class comprises the frogs and toads, the salamandroids, the cæciliæ, and the extinct labyrinthodonts. See Amphibia and Batrachia.

Class III., Reptilia.—The reptiles are divided into ten orders, four of which are represented by living forms, and six of which are extinct. The living orders are, 1, *chelonia*, the tortoises and turtles; 2, *ophidia*, the serpents; 3, *lacertilia*, the lizards; 4,

crocodilia, the crocodiles and alligators. The extinct orders are 5, *ichthyopterygia;* 6, *sauropterygia;* 7, *anomodontia;* 8, *pterosauria;* 9, *dinosauria;* 10, *theriodontia.*

Order 1, *Chelonia* (q.v.).—See also Tortoise, Turtle, and Snapping-turtle.

Order 2, *Ophidia*—comprising the snakes and serpents. See Serpents, Boa, Cobra-di-Capello, Coluber, Elaps, Lachesis, Puff-adder, Python, Rattlesnake, Toxodontia, Trigonocephalus, and Viperidæ.

Order 3, *Lacertilia*—comprising those animals commonly known as lizards and some serpent-like forms, and having the following general characters: Two pairs of well-developed limbs as a rule, but there may be but one pair, and sometimes there are no limbs; but a scapular arch is always present. There is generally an exo-skeleton in the form of horny scales, like those of snakes. The vertebræ of the dorsal region are concave in front, but rarely concave at both ends. There is a single transverse process at each side of a vertebra, and the heads of the ribs are simple and undivided. There is either no sacrum, or the sacral vertebræ rarely number more than two. The teeth are not set in distinct sockets, except in some extinct forms, and the eyes are usually furnished with movable eyelids. The heart contains two auricles and a ventricle, the latter being partially divided by an incomplete partition. The order lacertilia are often grouped with the crocodilia, under the name sauria, and this is a convenient term to designate all reptiles which resemble the typical lizards. All the lacertilians have teeth, which are always simple; sometimes sharp and conical, as in *monitor;* sometimes blade-like, with serrated edges, as in *iguana;* and sometimes with rounded, crushing crowns. The order is sometimes divided into three sections, according to the structure of the tongue. In the first section the tongue is long and can be protruded, as in serpents; in the second section, including the geckos, the tongue is thick and fleshy, and not protrusible; in the third section, which contains the chameleons, the tongue is long, protrusible, and worm-like, with a clubbed extremity. See Chameleon, Lizard, Gecko, Iguana, and Mososaurus.

Order 4, *Crocodilia.*—This is the highest order of living reptiles, and includes the crocodiles (q.v.), alligators (q.v.), and gavials (q.v.). See also Jacare and Cayman.

Extinct Orders of Reptiles.—Order 5, *Ichthyopterygia*, Owen (*Ichthyosauria*, Huxley). See Ichthyosaurus.

Order 6, *Sauropterygia*, Owen (*Plesiosauria*, Huxley). See Plesiosaurus.

Order 7, *Anomodontia*, Owen (*Dicynodontia*, Huxley). The prominent characters of this order are in the jaws, which are regarded as having been encased in horn, forming a kind of beak like that of chelonians. In the genus *oudenodon* both jaws were probably without teeth, but in the other genus, *dicynodon*, the upper jaw was furnished with two long tusks. The pectoral and pelvic arches were very strong, and the limbs well developed and adapted to walking and not swimming. These forms are found in the triassic strata of s. Africa and India.

Order 8, *Pterosauria.*—This order includes the extraordinary group of flying reptiles belonging to the mesozoic epoch. See Pterodactyl.

Order 9, *Dinosauria.*—Most of these animals were gigantic, and supposed by some to have had affinities with the pachydermatous mammals. The skin was sometimes naked, sometimes having an exo-skeleton of bony shields like those of crocodiles; anterior trunk-ribs double-headed; teeth set in distinct sockets. There were always two pairs of limbs, very strong, and furnished with claws. In some the fore limbs were small compared to the hind limbs. See Dinosauria, Hadrosaurus, Hylæosaurus, Iguanodon, Megalosaurus, and Titanosaurus.

Order 10, *Theriodontia.*—This order was established by prof. Owen for the reception of a number of carnivorous reptiles of the triassic period. The dentition is of the carnivorous type, there being three distinct sets of teeth, incisors, canines, and molars. The canines were long and pointed. In *cynodraco*, which is regarded as the typical genus, the canines are not only immense, but are compressed, and have the hinder trenchant border minutely serrated, as in the canines of the saber-toothed tiger or machærodus (q.v.). The humerus also resembles in some respects that of the cat family, and other carnivorous mammals, in having a supra-condyloid foramen for the protection of the median nerve and brachial artery.

Class IV., Aves.—See Birds. The members of this class may be defined as *oviparous vertebrates* with warm blood, a double circulation, and a covering of feathers (Owen). The embryo has an amnion and allantois, and branchiæ are never developed at any period of existence upon the visceral arches. The skull articulates with the vertebral column by a single occipital condyle. The form of the vertebral centra varies, but it is never amphicœlous or cup-shaped at both ends, except in the remarkable *ichthyornis dispar*, found by Prof. Marsh in the cretaceous rocks of North America. Each half of the ramus of the lower jaw consists of a number of pieces which are separate in the embryo, and the jaw articulates with the skull, not directly, but by the intervention of a *quadrate bone*, as in reptiles. This peculiarity, together with that of the possession of nucleated red blood globules, has led Prof. Huxley, notwithstanding vast differences in other respects, to place birds and reptiles in one division, to which he has given the name of *sauropsida* (q.v.). The heart, in birds, contains four chambers, two auricles and two ventricles, as in mammalia, and there is no communication between the pulmonary and systemic circulation, as in reptiles. The blood is warm

(103° to 104° Fahr.). The respiratory organs are in the form of spongy, cellular lungs, which are not freely suspended in pleural sacs, and the bronchi open into a number of air-sacs in different parts of the body. The respiration in birds is more complete and active than in any other class of vertebrates, which accounts for their higher temperature, and is naturally associated with their great activity and high order of *physique*. The following arrangement, somewhat altered from Cuvier's classification, is the one probably most generally followed. It includes seven orders: 1. Natatores, or swimmers; 2. Grallatores, or waders; 3. Cursores, or runners; 4. Rasores, or gallinaceous birds; 5. Scansores, or climbers; 6. Insessores, or perchers; 7. Raptores, or birds of prey. To these may be added two subclasses, saurornithes, containing the order *saururæ;* and odontornithes, containing two orders, *odontolcæ* and *odontornæ*.

Order 1, *Natatores*, divided into four families, viz., 1, *Brevipennatæ*, including the penguins (q.v.), auks (q.v.), guillemots (q.v.), divers (q.v.), and grebes (q.v.); 2 *Longipennatæ*, comprising laridæ (q.v.) and procellaridæ (petrels); 3, *Totipalmatæ*, including the pelicans (q.v.), cormorants (q.v.), gannets (q.v.), frigate bird (q.v.), darter (q.v.), and others; 4, *Lamellirostres* (q.v.), including the ducks (anatidæ), geese (anserinæ), swans (cygnidæ), and others. See Albatross, Anas, Brent-goose, Black-duck, Blue-wing, Canvas-back, Cereopsis, Garrot, Goose, Hareld, Kittiwake, Harlequin-duck, Musk-duck, Palamedidæ, Scaup-duck, Shell-drake, Shoveler, Summer-duck, or Wood-duck, Swan, Spheniscidæ, Teal, Tropic Bird.

Order 2, *Grallatores.*—See Grallæ, including the families *otidæ* or bustards (q.v.), *charadriadæ* (q.v.), or plovers (q.v.). See also Kildeer and Lapwing. *Gruidæ* or cranes (q.v.). See also Demoiselle. *Ardeidæ*. See Heron, Adjutant, Ibis, Marabou Stork, Night heron, Open-bill, Sand-hill Crane, Spoonbill Stork, Tantalus. *Scolopacidæ* (q.v.). See Avocet, Curlew, Godwit, Greenshank, Ruff, Snipe, Woodcock, Yellow-legs. *Rallidæ* (q.v.) or rail (q.v.). See also Gallinule, Ganga or Sand-grouse, and Notornis.

Order 3, *Cursores*, divided into two families, *struthionidæ* and *apterygidæ*. See Cassowary, Emu, Dinornis, Dodo, Ostrich, Nandu, and Apteryx.

Order 4, *Rasores*, or gallinaceous birds (q.v.), including the following families: *Columbidæ* (q.v.). See also Bronze-wing, Carrier-pigeon, Dove, Fruit-pigeon, Ground-dove and Ground-pigeon, Partridge-pigeon, Pigeon, and Turtle-dove. *Cracidæ*. See Curassow and Guan. *Phasianidæ* (q.v.). See also Argus, Fowl, Guinea-fowl, Lyre-bird, Pheasant, Macartney-cock, Turkey. *Tetraonidæ*, or grouse family. See Black-cock, Bonasia, Capercailzie, Francolin, Grouse, Partridge, Ptarmigan, Quail, Virginian Quail. *Chironidæ*. See Sheath-bill. *Tinamidæ*. See Tinamidæ.

Order 5, *Scansores* or climbers (q.v.), containing the following families: *Psittacidæ* or parrots (q.v.). See also Cockatoo, Lorikeet, Macaw, Paroquet, and Owl-parrot. *Ramphastidæ*. See Toucan. *Picidæ*, or woodpeckers (q.v.). See also Barbet and Wryneck. *Cuculidæ*. See Cuckoo and Honey-guide.

Order 6, *Insessores* (q.v.), divided into four sections or tribes, according to the form of the beak, viz., *conirostres*, *dentirostres*, *tenuirostres*, and *fissirostres*.

The conirostres contain the following families: *Fringillidæ* (q.v.), or finches (q.v.). See Beef-eater, Bullfinch, Bob-o-link, Crossbill, Goldfinch, Greenfinch, Hawfinch, Linnet, Ortolan, Pine-finch, Snow-bird, Snow-bunting, Weaver-bird, and Yellow-bird. *Corvidæ*, or crows. See Corvidæ, Crow, Magpie, Rook, Umbrella-bird. *Sturnidæ*, or starlings (q.v.). See also Bower-bird, Grakle, and Troopial. *Paradisidæ* (q.v.) or bird of paradise (q.v.). *Buceridæ*. See Hornbill (sometimes placed with corvidæ). The dentirostres contain the following families: *Sylviadæ* (q.v.), or warblers (q.v.). See also Beccafico, Beccamoschino, Black-cap, Golden-crested Wren, Hedge-sparrow, Nightingale, Tit, Tailor-bird, White-throat. *Muscicapidæ* (*colopteridæ*) or fly-catcher family. See King-bird, Fly-catcher, and Insectivorous Birds. *Lanidæ*, or shrikes (q.v.). See also Baritah, Vireo or Greenlet, and Woodchat. *Turdidæ* or *Merulidæ* (q.v.), or thrushes (q.v.). See also Ant-catcher, Banana-bird, Blackbird, Bluebird, Blue-throat, Dippér, Redbreast, Red-wing, Ring-ouzel, Robin, and Thrasher. The tenuirostres contain the families: *Ampellidæ* or chatterers (q.v.). See Bell-bird, Cotinga, and Wood-swallow. *Upupidæ*. See Hoopoe and Rifle-bird. *Trochilidæ*. See Humming-bird. The fissirostres contain several families whose classification is not well settled. See Bee-eater, Goat-sucker, Night-hawk, Whip-poor-will, Swallow, Swift, Pewee.

Order 7, *Raptores.*—The members of this order are distinguished by their strong, curved, sharp-edged, and sharp-pointed bills, the upper mandible being the longest, and hooked at the tip. The order is divided into two great sections: *nocturnal raptores* and *diurnal raptores*, the first comprising the single family *strigidæ* (q.v.), or owls (q.v.); the second, or diurnals, including two subsections or groups, *accipitrinæ*, comprising the falcons, hawks, and eagles, and the *vulturidæ*, or vultures. The raptores always live in pairs and the males and females are said to live together during life, instead of mating every season, like other birds. The female is generally larger than the male, but has less brilliant plumage. See Condor, Eagle, Eagle-hawk, Eagle-owl, Erne, Elanet, Goshawk, Falcon, Harrier, Hawk, Honey-buzzard, Lam-

MERGEIER, OSPREY, OWL, PIGEON-HAWK, PEREGRINE FALCON, SPARROW-HAWK, and VULTURE. The subclass saurornithes contains the order *saururæ*, which includes only the extinct bird *archæopterix macrura*, a single specimen of which has been discovered in the lithographic slates of Solenhofen, in the upper oolite. It was about the size of a rook, and had the remarkable peculiarities of two free claws on each wing, and a lizard-like tail, longer than the body, composed of separate vertebræ. The tail was destitute of a plowshare bone, and each vetebra supported a single pair of quills. The metacarpal bones were also not anchylosed together as in all other birds. The subclass odontornithes contains two orders, *odontolcæ* and *odontornæ*. See ODONTORNITHES.

CLASS V. MAMMALIA (q.v.).—This class comprises fourteen well-recognized orders, as follows :

1, *Monotremata* (q.v.).—See DUCK-BILL and ECHIDNA.

2, *Marsupialia* (q.v.).—See BANDICOOT, FLYING PHALANGER, KANGAROO, OPOSSUM, PHALANGER, PHASCOGALE, and YAPOCK.

3, *Edentata* (q.v.).—See AARD-VARK, ANT-EATER, ARMADILLO, GLYPTODON, MEGATHERIUM, MYLODON, SLOTH, WART-HOG.

4, *Sirenia* (q.v.).

5, *Cetacea* (q.v.).—See BELUGA, DELPHINAPTERA, DELPHINORHYNCHUS, DOLPHIN, GRAMPUS, KILLER, WHALE.

6, *Ungulata* (q.v.).—See ALPACA, AXIS, CAMEL, CAPRIDÆ, CASHMERE GOAT, BABYROUSSA, BOAR, BUSH ANTELOPE, BOUQUETIN, DZIGGETHAI, EQUIDÆ, HORSE, BARB, PONY, RACE-HORSE, QUAGGA, ASS, ZEBRA, BOVIDÆ, BUFFALO, GNU, ZEBU, MUSK-OX, OX, NIARE, SHEEP, GOAT, CARIACOU, DEER, ANTELOPE, ELAND, ELK, GAZELLE, HART, ROE, MUSK, REINDEER, MEGACEROS HIBERNICUS, KAAMA, IBEX, NYLGHAU, OREODONTIDÆ, PACHYDERMATA, STAG, TITANOTHERIUM, PALEOTHERIUM, TOXODONTIA, GAUR, HIPPOPOTAMUS, LOPHIODON, TAPIR, ZAMOUSE.

7, *Hydracoidea*.—See DAMAN.

8, *Proboscidia*.—See ELEPHANT, LOXODON, MASTODON, and DINOTHERIUM.

9, *Carnivora*.—Distinguished by always having two sets of teeth, which are simply covered with enamel, and are always of three kinds : incisors, canines, and molars. The clavicles are either altogether wanting, or are rudimentary. The order is divided into three sections : pinnigrada, plantigrada, and digitigrada. *Sec.* 1. *Pinnigrada*, comprises the amphibious seals and walruses. See PINNIGRADES, MORSE, OTARY, and SEAL. *Sec.* 2. *Plantigrada* (q.v.). See BADGER, BEAR, COATI, GLUTTON, and RACCOON. *Sec.* 3. *Digitigrada*, in which the heel is raised above the ground, so that the animals walk more or less upon the tips of the toes, but this characteristic varies. We will divide this section into five families : *Fam.* 1. *Mustelidæ* (q.v.). See ERMINE, FERRET, MARTEN, MINK, OTTER, POLE-CAT, and SKUNK. *Fam.* 2. *Viverridæ* (q.v.). See also ICHNEUMON, SURICATE, CIVET, and GENET. *Fam.* 3. *Hyænidæ*. See HYÆNA and AARD WOLF. *Fam.* 4. *Canidæ*, comprising the dogs, wolves, foxes, and jackals. See BEAGLE, BEDLINGTON TERRIER, BULLDOG, BLOODHOUND, CARRIAGE-DOG, COCKER, CERDOCYON, CORSAC, DHOLE, DOG, DOG-FOX, DUSICYON, FENNEC or ZERDA, FOX, FOXHOUND, GREYHOUND, HARRIER, HOUND, JACKAL, LAP-DOG, LURCHER, MALTESE DOG, MASTIFF, NEWFOUNDLAND DOG, NOOTKA DOG, POODLE, PUG, POINTER, SETTER, SHEPHERD'S DOG, WOLF, WOLF-DOG. *Fam.* 5. *Felidæ* (q.v.). See CAT, JAGUAR, TIGER, TIGER-CAT, OCELOT, PUMA, MACHÆRODUS.

10, *Rodentia* (q.v.).—In family *leporidæ* see HARE and RABBIT ; in family *hystracidæ* see PORCUPINE ; *spallacidæ*, see MOLE RAT ; *muridæ* (q.v.), see LEMMING, MOUSE, MEADOW-MOUSE, MUSQUASH, and RAT ; *dipodidæ*, see JERBOA ; *chinchillidæ*, see CHINCHILLA ; *castoridæ*, see BEAVER, COYPU ; *saccomyidæ* (q.v.), see POUCHED RAT ; *sciuridæ*, see DORMOUSE, FLYING SQUIRREL, GROUND SQUIRREL, MARMOT, PRAIRIE-DOG, SQUIRREL, WOODCHUCK.

11, *Cheiroptera*.—See BAT, NOCTILIONIDÆ, PTEROPIDÆ, VESPERTILIONIDÆ, PHYLLOSTOMIDÆ.

12, *Insectivora* (q.v.) *Talpidæ*.—See SHREW-MOLE, STAR-NOSE. *Soricidæ* (q.v.). See MUSK-RAT, SHREW. *Erinaceidæ*. See HEDGE-HOG. *Tupaiidæ*. See *Galeopithecidæ*. See FLYING LEMUR.

13, *Quadrumana* (q.v.).—See AYE-AYE, BABOON, BARBARY APE, CHIMPANZEE, DOUROUCOULI, ENTELLIS MONKEY, GALAGO, GORILLA, MARMOSET, MIDAS, MONKEY, NASALIS, NYCTICEBINÆ, ORANG, PONGO, SEMNOPITHECUS, SPIDER MONKEY, WANDEROO.

14, *Bimana* (q.v.).—See MAN, HOMINIDÆ, ETHNOLOGY, MALAYS, MONGOLS, NEGROES.

VER'TIGO, in medicine, designates a sensation which the patient describes as one of going to fall, or of turning round, or of everything turning round him. It comes on without premonitory symptoms, excepting a sense of disturbed balance, which may either precede, accompany, or follow it. Associated with it are frequently some of the following symptoms : flashes of light before the eyes, buzzing in the ears, painful sensations in the head, nausea, vomiting, trembling with cold perspirations, muscular tremors, a full, slow, or small and frequent pulse, flushing or pallor of the face, and cold feet.

Giddiness and *dizziness* are only other names for vertigo, although giddiness is com-

monly applied to its milder forms. Attacks of it come on in paroxysms, usually repeated several times a day, and lasting from a few minutes to a quarter of an hour. This disease is frequently chronic, the chief predisposition to it being in middle and advanced age. Childhood is nearly exempt from it, an observation in accordance with the well-known fact, that children can bear rapid rotatory movements without the induction of giddiness better than adults. A plethoric constitution, especially if associated with a sedentary mode of life, the so-called change of life in women, the debility brought on by exhausting discharges, and the abuse of spirituous liquors, may be regarded as predisposing causes to this affection. The direct cause of vertigo is doubtless an irregularity of the supply of blood to the brain. Hence any condition that occasions either an increase or diminution in the supply of blood, is followed by vertigo. For example, it commonly accompanies disease of the heart, and especially hypertrophy of the left ventricle; it is also induced by suppressed hemorrhoids, or other constant form of discharge or loss of blood. Injuries and diseases of the brain, and especially of the cerebellum, are often accompanied by this symptom, and so also are diseases of the spleen. Among the most common exciting causes are intoxication, not only from alcoholic drinks, but from narcotics, such as smoking tobacco, inhaling carbonic acid gas, or semi-poisoning by belladonna, digitalis, hyoscyamus, etc., gorging the stomach with indigestible food (especially if highly carbonated drinks are at the same time taken); unusual movements or positions of the body, and especially of the head, as in sea-voyages, continued stooping, etc.

There is a peculiar kind of vertigo which occurs in dreams. The direction of the apparent movement is generally from above downward; dreams of tumbling down stairs being, according to Romberg, the most common; people also dream of sinking into the earth, of chasms opening before them, etc.

According to Boerhaave, "vertigo is the most easily cured of all the diseases of the head." This statement is too positive; the vertigo that is caused by profuse discharges and exhaustion is curable, while it is beyond the aid of treatment when it accompanies cerebral disorganization. The *treatment* of course depends upon the cause; while in some cases tonics (the mineral acids, small doses of nux vomica, quassia, etc.) are required; in others, the local abstraction of blood from the nape of the neck, cold effusion, etc., are required. The following rules are, however, generally applicable for the treatment of patients subject to giddiness. They should avoid violent, continuous, or rotatory exercise, abstain from highly nutritious or heating articles of diet, and from suppers; they should not indulge in much sleep, or the use of feather-beds or of warm baths. Counter-irritation to the skin by sinapisms, foot-baths with mustard, the use of the flesh-brush, with cold washing of the body, and the administration of cooling laxatives are to be recommended. (A good laxitive of this kind is obtained by mixing six drams of sulphate of magnesia [Epsom salts] with two drams of carbonate of magnesia, and taking a teaspoonful three times a day.) When the patient feels the attack coming on, Romberg directs that he should "direct his full attention to movement. The patients do this, in a measure, of their own accord, by supporting themselves firmly with their hands and feet, in order to resist the illusory movement. The sense of vision may be employed for the same purpose; thus, the vertigo produced by rotatory movement of the body may be suppressed by looking steadily at the finger held up to the eye, or by turning round in a direction opposite to the previous movement."—*On Diseases of the Nervous System*, Syd. Soc. Ed. vol. i., p. 102.

Few of our readers are probably aware of the remarkable vertiginous conditions which they can artificially induce in their own persons. Purkinje, the well-known anatomist and physiologist, was the first who brought these remarkable facts within the range of experimental science in two memoirs published in 1820 and 1827. Vertical vertigo is thus produced. The experimenter—who must be standing—has a somewhat heavy weight attached to each hand, and as he carefully watches the sensation produced by gravitation for some time, he feels the weights growing heavier and heavier, till he can no longer bear them. On putting them down, when he feels he can bear them no longer, it appears to him as if he was impelled to mount straight upward, and as if the arms were shortened, and the hands must creep up to the thorax. Similar experiments with the muscles of the eye afford still more striking results. "If the face," says Purkinje, "be turned to the ceiling, and the eye be fixed on a given point, round which, as the pole of a vertical axis, the body is turned a certain number of times, the visible objects of the ceiling, as well as the floor of the room, will, if the position of the head and the direction of the eyes be maintained, appear to move in a horizontal direction. If, during the proceeding, the head be brought back into the ordinary upright position, the horizontal will be turned into vertical vertigo; and this sensation will be communicated to the tactile sense of the hands and feet, the floor appearing to sink down on one side, and to rise on the other."—See Rust's *Magazine*, etc., 1827, vol. xxiii. p. 290.

An analogous effect is produced by standing on the brink of, or in, a running stream, and fixing the eyes on the water; after a time, the sensation begins all at once of being borne along against the current. When this sensation comes on in wading in a river, it is very difficult to keep one's feet; and hence it is dangerous to let the eyes rest on the current close by.

Hitherto, we have spoken of vertigo, merely as a sensation; but there are certain

morbid conditions of the brain, and certain operations which experimental physiologists can perform upon it, that will give rise to what may be termed *vertiginous movements*, if we include under the term vertigo *straight* as well as circular movements, as is usually done by writers on this subject. From the experiments of Magendie and Flourens, which have been confirmed by Krauss and Hertwig, it follows that: 1. Removal of both corpora striata of the brain induces an irresistible tendency to advance, the animal shooting straight forward like an arrow; 2. Slicing the cerebellum, whether horizontally or vertically, causes the animal to walk backward; 3. Section of the corpora quadrigemina of one side, and of one side of the pons varolii, excites rotatory movements and gyrations of the animal toward the injured side; while division of the corresponding parts on the opposite side restores the balance. Vertiginous movements consequent on disease were described by the veterinary surgeons in sheep before they were noticed in the human subject. The *cœnurus cerebralis*, which is now known to be the larva of a species of tapeworm (*tænia cœnurus*) infesting the dog, is the well-known hydatid in the brain of sheep, producing in that animal the disease known under the various names of staggers, turn-sick, goggles, rotatory disease, etc. How this hydatid excites these movements when it destroys certain parts of the brain, is now explained by the experiments previously noticed. Dr. Romberg has collected a number of very interesting cases of vertiginous movements in the human subject.—On this subject, in addition to Romberg's work, the reader may consult a paper by Dr. Paget, "On Morbid Rhythmical Movements," in the *Edin. Med. and Surg. Jour.* (1847).

VERTIN, John, d.d., b. Carniola, Austria, 1844. He graduated at St. Francis sem. (Rom. Cath.), Milwaukee ; served as a missionary in n. Wisconsin, and in 1879 was consecrated bp. of Marquette.

VERTNER, Rosa (Griffith), now Mrs. Jeffrey, b. Miss., in 1828; educated at bishop Smith's seminary, Lexington, Ky., in which place she has spent most of her life. She has written many poems, collections of which were published in 1857, 1871, and 1881. She has also written the novels *Woodburn* (1864), and *Marsh* (1884), and many tales and sketches.

VERTUE, George, distinguished as an English engraver and antiquary, was born in London in the year 1684, of poor but respectable parents. At the age of 13; he was set to study under an eminent French engraver there; subsequently, he became a pupil of Michael Vandergucht, with whom he remained seven years, and in 1709, he commenced business for himself. He was generously befriended by sir Godfrey Kneller, the great portrait-painter of the day, who did much to procure him employment. His talent soon made itself recognized; and his eminent success in an engraved portrait of archbishop Tillotson, for which he received a commission from lord Somers, at once placed him in the very front rank of his profession. In 1711, on the institution of the academy of painting, with his friend sir Godfrey Kneller as president, he enrolled himself as a member: but his contributions were few and unimportant. In his own more special department, he wrought through life assiduously, confining himself for the most part to reproductions of the portraits of Kneller, Richardson, and one or two others of the more eminent painters of the day. On the accession of George I., he issued a large engraved head of that monarch, which had an immense run, much increasing his reputation with the public. Himself, from an early period, devoted to antiquarian research, which from time to time he prosecuted in journeys hither and thither throughout England, he was appointed, in 1717, engraver to the society of antiquaries, in which capacity he worked up to the time of his death, which occurred on July 24, 1756. He lies buried in the cloisters of Westminster abbey. In addition to his eminence in his art, he was a man of considerable general accomplishment; an adept in drawing and music, and with a competent knowledge of the French, Dutch, and Italian languages. He projected a *History of the Arts in England*, and had accummulated masses of material for it. At his death, his manuscripts were bought by Walpole, who made free use of them in his *Anecdotes of Painting in England*. In a supplementary volume of that work, entitled *A Catalogue of Engravers who have been born or resided in England*, a full list of his works is given, with some interesting notices of his character, the genuine unassuming worth of which is indicated in an unaffected expression of respect, of rather more than usual significance, as coming from the caustic and supercilious Walpole.

VERTUMNUS. See Pomona.

VERULAM. See Bacon, Francis.

VERVAIN (*Verbena*), a genus of plants of the natural order *verbenaceæ*, with a 5-cleft calyx, one division a little shorter than the rest, the limb of the corolla irregularly 5-lobed, the stamens (4 or 2) included within the corolla, the fruit a 4-seeded utricle, which soon breaks, so that the ripe fruit consists of four adherent achœnia. The species are herbaceous plants and small shrubs, with undivided. trifid, or multifid leaves, natives chiefly of the warmer temperate parts of the world. The common V. (*V. officinalis*) a perennial plant, with erect somewhat hispid stem, rough lanceolate inciso-serrate or trifid and laciniate leaves, and filiform spikes of pale lilac flowers, is a native of America and of most of the temperate countries of the world. It is a common ornament of flower-borders, continuing to blossom all summer. It had at one time a very high reputation as a medicinal plant, but its virtues are now regarded as imaginary. It has also been connected with some of the superstitious rites of different nations, as of the

Greeks and Romans, the ancient Persians, and the British Druids.—A number of species of vervain, chiefly American and East Indian, are occasionally cultivated for the beauty of their flowers.

VERVELS, or VARVELS, small rings attached to the ends of the jesses of a hawk through which the leash is passed that fastens the hawk to its block. They occur as a heraldic charge.

VERVICK, or WERVICQ, t. of Belgium, in the province of West Flanders, on the Lys, 8 m. s.e. of Ypres. It has important tobacco manufactories. Pop. '90, 7484.

VERVIERS, a prosperous manufacturing town of Belgium, in the province of Liège, most picturesquely situated on the river Vesdre, 15 m. e.s.e. of Liège on the Brussels and Cologne railway. It is of recent growth; and being composed wholly of workshops and of the dwellings of the manufacturers and their workmen, there are no remarkable objects of attraction. Verviers is the great center of the second-rate cloth manufactures in Belgium. Great quantities of cloth are exported, and the goods which are chiefly coarse woolens, are said to be better and cheaper than those of either France or England. Brewing, tanning, and dyeing are also important industries. The waters of the Vesdre possess qualities which render them admirably fitted for dyeing. Pop. '91, 48,907, and including the annexed suburbs, Dison, Ensival and Hodimont, 73,695.

VERY, JONES, 1813–80, b. Mass.; graduated at Harvard college in 1836 and was Greek tutor there for two years. Besides frequent contributions to periodical literature, he published *Essays and Poems* (1839). As a writer of sonnets he is thought by many to have been unsurpassed in this country, and his critical writings, though like his poems, few in number, show learning and insight.

VESALIUS, ANDREW, the celebrated anatomist, was a native of Brussels, where he was born in 1514. He studied classics at Louvain, and anatomy and medicine first at Cologne, then at Montpellier, and finally at Paris, where his preceptors were Gunther, Sylvius, and Fernelius. So keen was his love of dissection that, in order to procure subjects (at that time no easy matter), he ran considerable risks at the hands of the municipal authorities. Driven from Paris by the outbreak of war between Francis I. and Charles V., he returned to the Low Countries, where he served as physician and surgeon in the imperial army from 1535 to 1537. In 1540 he went by invitation to Pavia, where he taught anatomy till 1544. He afterwards gave public lectures on this subject at Padua, Bologna, and Pisa. Finally he was made physician-in-chief to Charles V. at Madrid, where he continued mainly to reside. He was now at the zenith of his prosperity, when an accident befell him which brought his career to a premature and disastrous close. A Spanish gentleman died in 1564, and permission to dissect the body was granted by his relatives to Vesalius. Life, however, was ascertained to be not quite extinct when Vesalius began the operation, the heart being found still palpitating. The family of the deceased, with inconsiderate vindictiveness, arraigned Vesalius before the inquisition, by which tribunal some terrible sentence would have been passed upon him, but for the interposition of Philip II., who procured for the unfortunate anatomist the milder penalty of an injunction to make a pilgrimage to the Holy Land. Vesalius, accordingly, in the train of the Venetian general Malateste, proceeded to Cyprus, and thence to Jerusalem. While sojourning in that city, he was invited to occupy the chair of anatomy, just vacated in Padua by Fallopius. It is supposed that, in compliance with this invitation, he embarked for Europe; but the ship in which he sailed was wrecked on the shore of Zante. Hunger and misery of mind proved too much for him, and he died in a village of that island in 1564.

Vesalius was one of those men of science who contributed to disenthral the minds of his contemporaries from their servile belief in the ancients. Galen was then to anatomy what Aristotle was to logical method; and Vesalius assailed his authority by independent researches into nature. His first great publication was a series of anatomical tables entitled *Suorum Librorum de Corporis Humani Anatome Epitome* (Basel, 1542, fol.). The plates, from drawings by the best masters, and engraved on wood, were nearly all re-incorporated in his great work *De Corporis Humani Fabrica Libri Septem* (Basel, 1543). Great value is placed on the earliest impressions of these plates, the explanations of which, however, were revised by Vesalius in his second (Basel) edition in 1555. He published in 1546 his severe attack on the errors of Galen's anatomy, the well-known *De Radicis Chinæ usu Epistola.* The cause of Galen was then espoused by Galen's disciple Fallopius, to whom Vesalius replied in his trenchant *Anatomicarum Gabrielis Fallopii Observationum Examen* (1561). After his death, a work entitled *Chirurgia Magna*, published under his name, but really a compilation from the ancient anatomists, was edited by his disciple Borgarucci. The great edition of Vesalius's works appeared with fine plates at Leyden in 1725, under the superintendence of Boerhaave and Albinus. See the lives by Burggraeve (1841), Mersman (1845), Meynants (1846), and Roth (1892).

VESICANTS, or BLISTERING AGENTS, are substances which, if kept in contact for some time with the surface of the body, excite such irritation as to cause the effusion of serum from the true skin, leading to the separation and elevation of the cuticle, and the formation of a vesicle or blister. They are employed in the practice of medicine for the

purpose of relieving or removing the diseased condition of some internal part, by producing a determination of blood from the interior to the surface over the seat of the affection. They likewise are of great value from their action as general stimulants to the system, and as such are often used with great benefit in the advanced stages of low continued fever. Moreover, they are not unfrequently employed for the direct purpose of withdrawing serum from the vascular system, and with this view they are prescribed with advantage in cases of sudden effusion into the pericardium or the pleura. Blisters used with this object should be of large size, and should be kept in contact with the skin sufficiently long to produce their full effect (24 hours being in some persons necessary for that purpose). Lastly, vesicants are occasionally applied to the surface of the body, for the purpose of removing the cuticle, so as to permit the direct application of various medical agents (especially mercury and morphia) to the absorbing surface of the true skin. It must be recollected that in infancy and childhood, owing to the extreme readiness with which inflammation of the skin is then set up, these agents must be used with extreme caution.

To produce vesication, *cantharidine*—the active principle of *cantharides*, or Spanish flies—in one of its various forms is generally employed, although other substances, afterward to be noticed, are occassionally used. Cantharidine is a white crystalline substance, which is extracted from the powdered insects by rectified spirit, and whose composition is represented by the formula $C_{10}H_6O_4$. It is a very active poison, and produces immediate inflammation of the skin whenever it comes in contact with it, is very volatile, even at ordinary temperatures, and is soluble not only in alcohol, but in chloroform, ether, strong acetic acid, and many oils. This substance is employed in the form of plaster (*emplastrum cantharidis* of the *Pharm. Brit.*), blistering fluid (of which there are several excellent forms, such as *acetum canth.*, *æther canth.*, and *collodion canth.*, none of which are in the *Pharm. Brit.*), and blistering tissue (of which there are several forms, known as *tela vesicatoria, charta ves., blistering cloth,** etc., none of which are officinal). Although the fluids and tissues are the cleaner and neater preparations, the old-fashioned *cantharides plaster* is far the most commonly employed in general practice, and is, by many of the authorities in the profession (among whom we may name the late Prof. Syme of Edinburgh, and Prof. Lister, now of London), considered as the most efficacious (its superiority being due to its slower and more prolonged action). In prescribing a blister, it is expedient to sketch the size and shape desired. Before applying it, the skin should be well washed with warm water. If the patient's skin is not easily acted upon, the part should be sponged with vinegar; while if it is very susceptible, and he is liable to strangury from the application of blisters, a piece of tissue-paper should be placed between the skin and the plaster. (In speaking of the plaster, which is a solid mass, we assume that it is spread on some fitting material, as wash-leather, soft brown paper, etc., the popular idea of a plaster always including the material on which it is spread.) In order to insure close contact with the skin, the blister should be gently warmed, carefully applied, so as to avoid creases, and kept in its place by a bandage. To produce their full action, blisters should remain from ten to twelve hours, and if on their removal after that time full vesication has not been produced, a hot bread-and-water poultice will often produce the desired effect. The raised cuticle should be punctured, to allow of the escape of the serum (except in the case of children and persons of very irritable skin, when the vesications should be left unopened), and a dressing of simple ointment or spermaceti ointment on soft rag applied, and repeated in twenty-four hours afterward; or the part may be at once covered with cotton-wool, which until it gives off a bad smell, can remain till the skin is healed. The troublesome *itching* which often follows the application of a blister, is best relieved by the application of a bread-and-water poultice, moistened with the dilute solution of acetate of lead, formerly known as Goulard's *vegeto-mineral water*. Dr. Neligan, in his highly practical work *On Medicines*, speaks so strongly of *collodium vesicans* as a blistering agent, that although we have no personal experience of it, we shall, on his authority, briefly notice it. It is prepared, when required, by mixing together equal parts of collodium and cantharidal ether (obtained by digesting for three days one part of coarsely powdered cantharides in two parts of sulphuric ether, and expressing). It possesses the advantage that its strength can be readily increased or diminished. "It is now much used for blistering," he observes "owing to its cleanliness, its certainty, and the facility with which it may be applied in the neighborhood of joints, or to other parts which are difficult to blister by the ordinary method. It is applied with a camel-hair pencil; two scruples are sufficient to blister a surface as large as the palm of the hand. It is preferable to apply the quantity to be used twice, instead of at one time, on the place to be blistered."

When a blistering agent with very rapid action is required, as in the state of collapse in cholera, recourse may be had to the application of boiling or nearly boiling water† to

* We have not included the well-known *papier d'Albespeyres*, which is often sold for this purpose, because it is not sufficiently powerful. It is useful for keeping open an already blistered surface.

† Strange and paradoxical as it may appear, "in the absence of other more suitable means, *cold water* may be used as efficiently as boiling water, and will not present so formidable an appearance to the patient. A piece of bibulous paper (common blotting-paper, for example) should be soaked in cold water, applied to the part to be vesicated, and covered with three or four folds of dry paper. A common smoothing-iron heated to 212° should now be pressed three or four times over all, and on removing the paper, the part will be found vesicated."—Neligan, *op. cit.*, p. 325.

a portion of the abdomen, the surrounding surface being protected by a wall of damp cloths; or in less urgent cases, as retrocedent gout showing itself internally, an almost immediate blister may be produced by saturating a piece of lint of the size of the desired blister in the strong solution of ammonia, and applying it to the skin with moderate pressure. By the time that the ammonia has evaporated, the required result is usually obtained. When it is desired to keep up a discharge from a blistered surface (instead of healing it, as is most commonly required), or to produce a *perpetual blister*, we dress the raw surface with irritants of various kinds, such as savine ointment, *papier d'Albespeyres*, etc. At each fresh dressing, which in summer should take place twice a day, the part should be cleansed with warm water.

VESICA PISCIS (barbarous Lat. bladder fish, bladder evolved out of a fish), a term often, but not very correctly, used for the aureole or glory, of a pointed oval shape, formed by the intersection of two circles, which, in the religious symbolism of the early middle ages, is often represented encircling the whole body of the Saviour. This form is supposed to have been gradually evolved out of the figure of the fish, which is prominent in the symbolism of the early Christians on sarcophagi and elsewhere, and whose use arose out of an anagram on the initial letters of *Ιησοῦς Χριστὸς Θεοῦ Υἱὸς Σωτήρ*, Jesus Christ, son of God the Saviour. The ovoidal form, generally designated by English antiquaries the Vesica Piscis, is much used in painted glass, and became from the 12th c., the almost invariable form of the seals of ecclesiastical persons and institutions.

VESOUL, a small t. in the e. of France, capital of the dep. of Haute-Saône, stands in a fertile and picturesque country, overlooked by the mountain called the Motte-de-Vesoul, at the confluence of the Columbine with the Durgeon, 236 m. e.s.e. of Paris. The manufactures of the town are unimportant, but the environs are as fertile as they are beautiful. A trade in grain, hay, hides, and wine is carried on. Vesoul is the birthplace of the artist Gérôme. Pop. (commune), '91, 9770.

VESPASIA'NUS, Titus Flavius, Roman emperor, was a native of Reate, in the Sabine country, of humble origin. After serving with distinction in various military grades in Thrace, Britain, and Africa, he was sent by Nero to conduct the Jewish war. This appointment he owed to his recognized merits, for he was not a favorite with the emperor, whom he had offended by falling asleep during the recitation of one of his poetical compositions. He conducted the war with vigor, reduced Judæa, and finally laid siege to Jerusalem. At this time occurred the struggle for the imperial dignity between Otho and Vitellius, after the murder of Galba. The legions serving in the east were indignant that the empire should be disposed of at the will of the prætorian guards. Their own gen. was proclaimed emperor, and quickly acknowledged as such by all the east, and, after the death of Vitellius, by Italy and all the provinces. Leaving his son Titus to prosecute the siege of Jerusalem, he repaired to Rome, where he was joyfully received, and immediately set about the work of restoring order. He kept his soldiers under firm discipline, improved the finances, co-operated cordially with the senate in the administration, and did much by his example to lessen the ill effects of the prodigality and luxury of his predecessors. An interesting biography of him has been written by Suetonius, and from the personal anecdotes there recorded, we are enabled to estimate clearly the character of the man. He was simple and unostentatious in his mode of life, too shrewd to listen to flattery, liked a joke, was good humored, and easy of access. He is charged with being avaricious, and at times he certainly sought to obtain money by rather undignified ways; but though niggardly in personal expenditure, he was lavish in embellishing the city with public works, and a munificent patron of the arts and sciences. He is chargeable also with one or two acts of cruelty, but usually he bore provocation with great good temper. He died 79 A.D., in the 69th year of his age, after a reign of 10 years.

VESPERS (Lat. *vespere*, in the evening), one of the canonical hours of the breviary, called also anciently *lucernarium*, from *lucerna*, a lamp. It is a service of very ancient use, being plainly referred to in the apostolical constitutions, and is noticeable as that one among the canonical hours which in the Roman Catholic church continues to be regularly sung as one of the ordinary public services of parish churches, no less than in cathedrals where the entire of the hours are chanted. It resembles lauds, and consists of five psalms and antiphons, a lesson, a hymn with versicle and response, a canticle (the magnificat), and a collect or prayer. The psalms sung at vespers are Ps. cix.–cxlvii., which are distributed over the several days of the week. The service of vespers has given occasion to some of the most brilliant efforts of modern musical composers. The evening prayer of the English prayer-book corresponds partly with the vespers, partly with the compline (*completorium*) of the Roman breviary.

VESPERTILIONIDÆ, one of the four families of the insectivorous section of bats, comprising the ordinary bats of the old and new world, and distinguished by having a dentition much like that of other insectivorous mammals, the molar teeth being furnished with cusps adapted for crushing insects, and the incisors small. The nose has no leaf-like appendages. The tail is elongated and inclosed in a large membrane extending between the thighs. The family has a wide range, embracing most of the species of northern temperate countries. It has been divided into about 20 genera, by far the most extensive of which is *vespertilio*. See Bat and Noctilionidæ.

VESPUCCI, Amerigo. See Amerigo Vespucci.

VEST, George Graham, b. Frankfort, Ky., 1830; graduated at Centre coll., Ky., 1848, and at the law dept. of Transylvania univ., 1853; removed to Mo. to practice; was in the state legislature, 1860-61. He was a member of the Confederate congress for three years; was elected, as a dem., to the U. S. senate in 1879, 1885, 1890, and 1897.

VES'TA—VES'TALS. Vesta, an ancient Latin divinity, whose worship was the embodiment of an idea deeply rooted in the Latin, and particularly in the Roman mind—viz., that the state was one great family. As the Lares were the tutelary guardians of the individual household, so the Penates and Vesta watched over the welfare of the state. The Greek *hestia* (hearth) is a kindred conception; and if the word is the same, it may be conjectured that the worship of the chaste divinity that presided over domestic life goes back to a period when the Greeks and Latins were still an undivided people. The state, we have said, was regarded by the Latins as one great family, so each community had its public altar to Vesta, the central one for the whole Latin people being at Lanuvium, about 20 m. from Rome, on the Appian way, where the Roman consuls and other officers offered sacrifices on entering upon their offices. The common hearth of the Greeks was at Delphi. There was also a temple of Vesta at Rome, which stood in the forum, near the temple of the Penates (see Lares, etc.), between the Palatine and Capitoline hills; it was open during the day, and closed during the night. On the first of March each year, the sacred fire was renewed; on June 9, the *vestalia* were held in honor of the goddess; and on the 15th of that month, the temple was cleared out, and the dirt carried into a narrow lane (*angiportus*) behind the temple, which was locked by a gate, that none might enter. See illus., Mythology, vol. X., fig. 7.

The goddess herself was a virgin, and her fire was carefully tended night and day by the *Vestal* virgins. The number of these priestesses was originally four, but two were subsequently added, increasing the number to six. At first, they were chosen by the kings; but after their expulsion, by the pontifex maximus, who, when a vacancy had to be filled up, selected twenty damsels between the ages of six and ten years, from among whom one was chosen by lot. A father could offer his daughter for the office, if he chose, but this seldom happened. The necessary qualifications for the office of Vestal were, that the maiden should be the daughter of free-born parents, then alive and resident in Italy, and engaged in no dishonorable occupation; that she herself should not be younger than six, nor older than ten years, and free from any physical defect. The period during which the priestess was bound to the service of Vesta was thirty years, the first ten being occupied with learning her duties, the next in performing them, and the last in teaching them to others. When she entered upon her office, the Vestal took upon herself a solemn vow of chastity for the thirty years of her service, the dreadful punishment of a violation of which was, that she should be buried alive in a subterranean vault near the Colline gate, to which she was carried on a bier, as if dead, and where she found a light, with a scanty supply of bread, water, milk, and oil. The chief duty of the virgin priestesses was to keep the fire on the altar of the goddess ever burning; they had also to present offerings to Vesta, sprinkle the temple every morning with water drawn from the Egerian well, and guard the sacred relics, which were a pledge granted by fate for the permanency of the Roman sway. As the extinction of the sacred fire was looked upon as emblematic of the extinction of the state, the Vestal who, by neglect of duty, allowed this to happen, was severely punished, the penalty being, that she should be stripped and scourged by the pontifex in the dark; the fire was again rekindled by the friction of two pieces of wood from a "lucky tree."

As a compensation for the strictness of the lives which they had to lead, the Vestals had many privileges bestowed upon them: among others, they were entirely freed from paternal authority; could make a will, and give evidence without taking an oath; had a seat assigned them in the best part of the theater; were held in the greatest honor, and done homage to by the highest officers of the state; and even the plebs, in their most reckless moments, respected them. If, when out walking, their eye should chance to light upon a criminal, he was set free. At the expiration of her period of service, a Vestal, if she chose, could marry, although to do so was considered very unlucky.

VESTIBULE TRAINS. Trains fitted with vestibule connections between the cars. The "vestibule" consists of a frame-plate extension at either end of the cars, completely enclosing the platforms. They are fitted with doors for entry and exit, and with buffers to prevent the racking of the car frames in curves and stoppages. The first vestibuled train between New York and Chicago, made up of five cars, went over the Pennsylvania Central in April, 1887. In December following, a train of six cars was put on the limited line of the New York Central. They became rapidly popular. The space enclosed constitutes in reality an extension of one car into another car, like the openings between drawing-rooms. They are considered much safer than ordinary trains, as in case of collision they are less likely to be "telescoped."

VESTMENTS, Sacred, the peculiar habiliments worn by ministers of religion in the public discharge of their office, and sometimes in other sacred ministrations, even when privately performed. The use of a distinctive costume in public worship formed a part not only of the Jewish, but of almost all the ancient religions, and has been found in a greater or less degree in the religions of the new world. See Lipsius, *De Monument. et Exemp. Polit.*, l. i. c. 3. The whole 28th chapter of Exodus is taken up with a descrip-

tion of the vestments of the high priest; and the directions for those of the inferior functionaries are almost equally minute. Whether the same characteristic was carried into the early Christian worship, has been a subject of controversy; some writers being of opinion that the peculiar sacred costume which we find in use among Christian ministers from a very early period was not originally peculiar to the clergy, but was simply the ordinary costume of Rome and of the east in the first centuries, and only came to be a costume distinctive of sacred ministers, because by them it was retained unaltered, whereas in the every-day world the costume varied in fashion, in material, in color from year to year. There seems little room, however, for doubting, that from a very early time Christian ministers did employ some distinctive dress in public worship; and Catholic writers even find traces in the beginning of the 5th c. of the practice of blessing the vestments which were destined for the public services of the church. See Binterim, *Denkwürdigkeiten*, IV. i. p. 198. From the 8th c. downward, the rituals of the west all contain formularies for the blessing of the several sacred vestments worn by bishops, priests, deacons, and lower clergy. The vestments used in the celebration of the mass by priests of the Roman Catholic church are six in number,—viz. (1) the amice, a square piece of linen, which is worn upon the shoulders, and in some of the religious orders, over the head, which latter, indeed, appears to have been the ancient mode of wearing it; (2) the alb, a long, loose-sleeved, linen gown, sometimes richly embroidered or "apparelled" at the lower border; (3) the cincture, a linen cord tied around the waist, and confining the folds of the alb; (4) the maniple, a narrow strip of embroidered silk, worn pendent from the arm; (5) the stole, a long narrow scarf, similarly embroidered, and worn by priests around the neck, the ends being crossed over the breast or pendent in front, and by deacons transversely over one shoulder; (6) the chasuble, a loose flowing vestment, open at the sides, having a hole in the center, through which the head passes, and falling down over the breast and back to some distance below the knees. Most of these vestments have been already briefly described. The three last named are always of the same material and color; but this color, which appears primitively to have been in all cases white, now, and for many centuries, varies according to seasons and festivals, five different colors being employed in the cycle of ecclesiastical services—viz., white, red, green, violet, and black. Cloth of gold, however, may be substituted for any of these, except the last. A cap, called *biretum*, is worn in approaching the altar, but is laid aside during mass. Besides these vestments, which are worn by priests during the mass, bishops in the same service use also two inner vestments, of nearly the same form as the chasuble, called "dalmatic" and "tunic," as also embroidered gloves and shoes, or buskins, together with the distinctive episcopal ornaments—the pectoral cross, the miter, the pastoral staff, or, if archbishops, the crosier, and ring. Archbishops celebrating mass also wear the pallium (q.v.). Deacons, at the same service, wear a robe, called dalmatic; and sub-deacons, a tunic. The sub-deacon is not privileged to wear the stole. In other public services, priests and bishops wear a large flowing cloak, called cope (Lat. *pluviale*), with a pendent cape or hood, called orfrey. In the ministration of the other sacraments, and also in administering communion, priests wear the surplice (which is but a short alb) with the stole. The vestments of the Greek priests differ considerably in their general character and effect from those of the Latin clergy, but the several portions of the costume are substantially the same as those of the Latin costume already described. The *stoicharion*, the *zoné*, the *orarion*, the *epimanikia*, and the *phelorion*, correspond respectively with the alb, cincture, stole, maniple, and chasuble. Greek bishops wear the *omophorion*, which corresponds with the later pallium. The *phelorion*, however, is so ample in its folds as to resemble the Latin cope rather than the chasuble; and the general effect of the Greek vestments, which may be said to resemble in all particulars that of the other eastern rites, is much more picturesque.

The natural effect of the religious changes of the 16th c. was to put aside the costume at the same time and on the same grounds with the ceremonies of the existing worship. This was done, however, by the different churches of the reformers in very various degrees. The Calvinistic worship may be said to have dispensed with vestments altogether. The Lutherans generally retained with the cassock the alb, and in some countries the chasuble. In the English church a variety of practice has existed. The disputes about the use of the surplice (q.v.) have been already described. As to the rest of the costume, the first prayer-book retained the Roman vestments with little change; and as, by a remarkable accident, the rubric of this prayer-book has never been formally repealed, a so-called ritualistic movement in the English church has re-introduced in some places almost every detail of the Roman costume in the communion and other services. See illus., Priests, Monks, and Nuns, vol. XII.

VESTRIS, the name of a family of dancers of Italian origin. The most famous of them was Madame (Bartolozzi), 1797–1856; b. London; wife of the dancer Auguste Armand Vestris. She made her first appearance in opera in 1815. She was afterward a successful English actress and contralto singer. Her second husband was the younger Charles Matthews. Gaetano Apollino Baldassare (1729–1808; b. Florence) and Marie Auguste (1760–1842; his natural son) were famous opera dancers in their time.

VESTRY, in English parishes, is a meeting of the inhabitants of the parish assembled to deliberate on some matter which they have a right to decide (see Parish). The ves-

try is the regular organ through which the parish speaks; and in numerous matters relating to church-rates, highways, baths, and wash-houses, and other sanitary matters, it has important functions to discharge, and is a conspicuous feature of parochial management. A statute was passed in 1818 to regulate the mode of procedure. No vestry, or meeting of inhabitants in vestry, shall be held until public notice of the place and hour of meeting be given, as well as of the special purpose of such meeting. This notice is required to be given by publishing it on some Sunday before the celebration of divine service, by affixing a written or printed copy on the principal door of the parish church or chapel. Such notice is to be previously signed by a church-warden. In the American Epis. church, the duties of the vestry of a parish differ from those of bodies bearing the same name in the church of England, this difference being due to the separation in this country of church and state. These duties vary according to the canonical law of each diocese, or the by-laws of the several parishes. A committee appointed by the General convention has for a long time had under consideration the most advisable means of reducing these varying duties to uniform practice, thus saving needless confusion and disorder. The vestry have certain well-understood general duties to perform, however, alike in every diocese: they must notify the bishop when their parish is vacated, in order that the services may be maintained; they must inform the bishop of the election of a new rector, because upon the bishop's decision, or that of the standing committee acting in his stead, depends the recognition of the rector's right to the control of his parish; they must give to the diocesan, at his annual visitation, such information as he may desire. The vestry have no control over the spiritualities of a parish; they are merely the legal representatives of the parishioners in the temporal care and financial management of the church organization. The rector gives his resignation to the vestry upon withdrawing from a parish; but the vestry cannot remove him without some urgent cause. In the spiritualities, including the conduct of the worship, he is responsible only to his ecclesiastical superior, viz., his diocesan. The rector, on the other hand, must consult with his vestry before entering upon work involving financial outlay. In consistently regulated parishes, the rector is chairman of the vestry, and has a voice in their proceedings. See *The Rights and Duties of Rectors, Church-wardens, and Vestrymen*, by Rev. H. M. Baum. The word vestry is also applied to a room attached to a church, in which vestments and sacred vessels are kept, and in which parochial meetings are held. In New England the name vestry has been retained by the Congregational churches, and is applied to a room, or separate building, used as a chapel, or "lecture-room."

VESU'VIAN, or IDOCRASE, a mineral, allied to garnet, and sometimes called *pyramidal garnet*. It is found in volcanic and in primitive rocks. It is frequent in masses ejected from Vesuvius, whence its name. The hardness is about equal to that of quartz. The colors are various—yellow, green, brown, almost black, rarely azure. Vesuvian is composed of silica, alumina and lime, in somewhat varying, but not very unequal proportions, with a little oxide of iron and oxide of manganese. It is employed as an ornamental stone, but is not very highly valued. The green-colored varieties are known as *volcanic chrysolite*, and the brown as *volcanic hyacinth*.

VESUVIUS, a well-known volcano, is situated near the e. shore of the bay of Naples, about 10 m. from the city of that name. It is a solitary mountain, rising majestically from the plain of Campania, having at the base a circumference of about 30 m., and dividing, at a certain height, into two summits, Somma and Vesuvius proper. The height of the mountain and form of its apex are subject to frequent changes by eruptions. It is estimated to be at present about 4270 ft. high. In the single eruption of 1822 it lost 800 ft., nearly all of which has been restored by subsequent eruptions. Before that event, the summit was a rough and rocky plain, covered with blocks of lava and scoriæ, and rent by numerous fissures, from which clouds of smoke were given out. But it was then altered to a vast elliptical chasm, 3 m. in circumference, three-quarters of a mile at the greatest diameter, and about 2,000 ft. deep.

The first recorded eruption took place in the year 79 A.D. Warnings had been given sixteen years before by a great earthquake, which shattered the cities of Herculaneum and Pompeii, and the earth was frequently shaken by slight shocks until August of the year 79, when they became more numerous and violent. Previous to this, Vesuvius was not suspected to be a volcano. Its sides were covered with famous vines, and its ancient crater, partly filled with water, formed the stronghold of the rebel chief, Spartacus. The morning of Aug. 24 brought comparative repose; but in the course of the day, a huge black cloud rose from the mountain, from which stones, ashes, and pumice were poured down on all the region around. The elder Pliny, who commanded the Roman fleet at Misenum, sailed to the help of the distracted inhabitants: he landed near the base of the mountain, was enveloped in sulphurous vapor, and was suffocated. The younger Pliny gives a graphic account of the eruption in two letters to Tacitus, which are well known. No lava was ejected on this occasion, nor indeed in any eruption in historic times up to the year 1066. Pompeii was buried under a thickness of 20 ft. of loose ashes, and remained unknown until about a century ago. A torrent of mud spread over Herculaneum, which, by additions from subsequent repeated eruptions, now forms a thickness of 80 or 100 feet. Since this first famous eruption, Vesuvius has been an active volcano, and has been frequently but irregularly in eruption, about 60 great

and numerous smaller ones having taken place. In 472 the eruption was so great that the ashes fell even at Constantinople, and caused great alarm there. The summit known as Monte Nuovo was, in 1538, forced up in two days to the height of 413 ft., and with a circumference of 8,000 feet. In 1631 the villages at the foot of the mountain were covered with lava, and torrents of boiling water were sent forth. Since that described by Pliny, one of the most famous is the eruption of 1779, of which sir William Hamilton, then British minister at Naples, gives an interesting account. In the spring of that year it began to pour forth lava; this was succeeded by rumbling noises and puffs of smoke; then jets of red-hot stones and ashes made their appearance, and increased in number and intensity, until the eruption arrived at its climax between Aug. 5 and 10. Then enormous volumes of white clouds rose from the crater to a height four times that of the mountain, and lava poured from the crater in torrents down the sides of the cone. This was followed by columns of fire, which rose on some occasions to three times the height of Vesuvius, or more than two miles. In the midst of all this, showers of stones, scoriæ, and ashes were thrown out to a great height. One mass of rock ejected was 108 ft. in circumference, and 17 ft. high. A more terrible eruption took place 15 years later, by which the greater part of the town of Torre del Greco was destroyed. The violent eruption of 1822 has already been alluded to. A remarkable eruption occurred in May, 1855. In 1865 began a series of eruptions, which have been repeated at intervals since. For a full account of the fearful outbreak of April, 1872, we are indebted to Palmieri, director of the meteorological observatory on mount Contaroni, a part of Vesuvius, who with great courage remained in the observatory while it seemed threatened with destruction. An eruption much less destructive than that of 1872 took place in 1878, and another in 1880. A railway to the top of V. was opened, 1880.

VESZ'PRIM (Ger. *Weiszbrunn*), a t. in the w. of Hungary, on the Séd, 70 m. s.w. of Pesth. It contains a handsome episcopal palace, a fine cathedral, a Piarist college, gymnasium, and an institution for decayed or disabled priests. Cloth and flannel-weaving, silk-spinning, the cultivation of wine, fruits, and tobacco are the principal industries: but coal-mining, iron-works, large cattle-markets, and general trade are carried on. The town has been on several occasions in the possession of the Turks; and an interesting memorial of them is a slender minaret, which rises from an old Gothic tower, and which now serves as a watch-tower against fire. Pop. '90, 12,655.

VETCH, *Vicia*, a genus of plants of the natural order *leguminosæ*, suborder *papilionaceæ*, having a tuft of hairs on the style beneath the stigma, nine stamens united, and one free. To this genus the *bean* (q.v.) is generally referred. The species, however, are mostly climbing plants, annuals, with pinnate leaves ending in tendrils, and with no terminal leaflet. A number of species are natives of America. The common vetch (*V. sativa*), sometimes called by agriculturists TARE, frequent in cultivated ground in Britain and throughout Europe, and itself much cultivated as green food for cattle, has rather large purple, blue, or red flowers in pairs, axillary and almost sessile. In cultivation it varies considerably both in size and other particulars, as in the breadth of the leaflets, the number of them in a leaf, etc. Oats are generally sown along with it to afford it a little support, and thus prevent its rotting in wet weather.— *V. cracca* and *V. sepium* are very common British species, the former with many-flowered stalks, bearing beautiful bluish-purple flowers, being one of our most beautiful climbing plants, and a chief ornament of trees, hedges, and bushy places in the latter part of summer. These and other species, natives of Britain or of different parts of Europe and the n. of Asia, have been either occasionally cultivated as food for cattle or recommended for cultivation, and generally agree with the common vetch both in their qualities and in the mode of cultivation which they require. *V. biennis* and *V. narbonnensis* are among those chiefly cultivated in some parts of Europe. The species of vetch are very numerous, chiefly in the temperate parts of the northern hemisphere.

VETCH, BITTER. See OROBUS.

VETCHLING. See LATHYRUS.

VETERAN CORPS are among the military reserves of all nations. They consist of old soldiers past the prime of active manhood, and incapable of taking the field. Their discipline and steadiness, however, admirably fit them for garrisons or fortresses, and for the instruction of young troops. The veteran battalions did good service during the French war as home guards, releasing the active troops for foreign service. The English army estimates for 1891 made provision for an army reserve (including pensioners) of 63,980 men. But from the short periods during which men serve as soldiers, and the number of officers who quit the army on reaching the rank of captain, it is almost certain that very large veteran corps could be formed from civil life in any case of national emergency.

VETERAN RESERVE CORPS, in the United States, an organization established during the civil war, but now discontinued. It was composed of men honorably discharged on account of wounds or disabilities, of men absent from their colors in hospitals or convalescent corps, and of men disabled by wounds or disease, but still in the field. In May, 1865, the body consisted of 762 commissioned officers and 29,852 men. The duties of the veteran corps were varied, and included such work as hospital and gar-

rison service and patrol duty. They were serviceable in taking the place of efficient soldiers who were needed in the field.

VETERINARY MEDICINE (Lat. *veterina*, beasts of burden; probably for *vehiterina*, from *veho*, to carry) embraces the medical management of the domestic animals, and appears to have been studied by the ancient Egyptians as well as by the Greeks and Romans. Hippocrates contributed a treatise on equine disorders; Columella and Vegetius (the latter of whom flourished about 300 A.D.) have left several curious veterinary works. Until after the middle of the 18th c. there were, however, no schools for the teaching of veterinary science or art. The several works published in France, Italy, and elsewhere were not of great value. In this country, Blundeville and Gervase Markam, who lived in the reign of Elizabeth, published volumes on farriery; Snape, farrier to Charles II., produced an anatomical treatise on the horse; Mr. Gibson, previously a surgeon in a cavalry regiment, paid much attention to the disorders of animals, and about the middle of last century published *The Farrier's Guide*, which continued for many years the best authority on the subject. The treatment of sick horses remained, however, in the hands of the riding-master, the groom, or the shoeing-smith, or farrier (from *ferrum*, iron); while the doctoring of the other domestic animals devolved upon the goat-herd, shepherd, or cow-leech.

Veterinary medicine, as a scientific art, takes date from 1761, when the first veterinary college was established at Lyons with royal patronage, under the able teaching of Bourgelât. Five years later the flourishing school of Alfort, near Paris, was founded. In Feb.. 1791, the London college was organized, Charles Vial de St. Bel being appointed principal, with Delabere Blaine as assistant-professor. St. Bel died in 1793, and was succeeded by Mr. Coleman, who, during many years, zealously improved the position and teaching of the college. In Scotland lectures on veterinary medicine were first given by Mr. Dick in 1819. Under the auspices of the Highland and agricultural society, and senatus academicus, Mr. Dick in 1823 began his systematic teaching of veterinary surgery. Soon afterward he erected the college buildings in Clyde street, Edinburgh, with hospital for sick animals; he collected a valuable museum; extended the curriculum of study; and engaged efficient assistants, among whom were John Barlow and Dr. George Wilson, to instruct his pupils in anatomy and physiology, chemistry and materia medica, cattle practice and histology. At his death in April, 1866, Mr. Dick bequeathed to the city of Edinburgh the college which he had founded, and his entire fortune, to be devoted to the teaching and improvement of veterinary medicine. For many years upward of 80 professional pupils, with a number of agricultural and amateur students, have annually attended the classes at the Edinburgh veterinary college. About 150 are enrolled at the Camden Town college, London. In 1857 Mr. John Gamgee established the new veterinary college in Edinburgh, which existed till 1865, when Mr. Gamgee went to London. The new veterinary college, Gayfield house, Edinburgh, was established by principal Williams, and recognized by royal sign manual in 1873. Since 1861 a veterinary school has been conducted in Glasgow by Mr. James Macall. An attendance at one or other of these colleges, during three sessions of six months each, and two sessions of two months, is required before a pupil can present himself to be examined for his degree. At the best continental schools four years study is usually necessary. The fees for the whole curriculum at the different educational establishments are about 36 guineas. At all the colleges—at London by the college of preceptors; at Edinburgh by the rector of the Royal high school and mathematical master; at Glasgow by the principal of the college—a preliminary examination is now required.

In 1844 a royal chapter was granted under which veterinary surgeons (graduates of either the London or Edinburgh college) became a corporate body, entitled "The Royal college of veterinary surgeons," with authority to appoint examining boards, and grant diplomas or licenses to practice. In 1876 a supplementary charter was obtained, empowering the Royal college of veterinary surgeons to grant the higher title of fellow, without examination, to the most eminent members of the profession who had been fifteen years in practice, and to appoint a board to examine candidates for the fellowship degree, each candidate to have been five years in practice. Nearly 3,000 persons now hold these diplomas, which cost £10 10s., and constitute the holder a member of the Royal college. For many years the Highland and agricultural society of Scotland annually appointed an examining board, consisting of medical men and skilled veterinarians; and at the cost of £2 2s., granted to pupils who had studied for two sessions at the Edinburgh veterinary college, a certificate which was ever fully recognized as a guarantee of professional ability by the public, and by the authorities at the horse guards and India office. The first veterinary college in the United States was the Boston (Mass.) Veterinary Institute, established in 1855, though no instruction was ever given there. In 1857, the New York College of Veterinary Surgery was chartered. The American Veterinary College was founded by professors who seceded from the New York College of Veterinary Surgery. The institution is still prospering, and has in connection with it a veterinary hospital. The professors are all graduates in medicine. Some of the agricultural colleges of this country have chairs of veterinary surgery and grant degrees in veterinary science.

The literature of veterinary medicine is rapidly widening. Mr. Percivall and Messrs

Gamgee and Law, and the late Prof. Strangeways, have published text-books on anatomy. The chief reliable authorities on diseases consist of Mr. Dick's excellent little manual of veterinary science; Percivall's *Hippopathology*, in 3 vols.; Mr. Gamgee's *Domestic Animals in Health and Disease;* F. Dun's *Veterinary Medicines, their Actions and Uses, with an Appendix on Diseases of Animals;* Tuson's *Pharmacy.* Late important contributions are Prof. Williams's *Principles and Practice of Veterinary Surgery* (Edinburgh, 1872); and *Principles and Practice of Veterinary Medicine* (Edinburgh, 1874), which have now reached their third and second editions. Mr. Fleming, v.s., r.e., has translated M. Chaveau's elaborate treatise on the *Anatomy of the Domesticated Animals* (1873); has published *Sanitary Science and Police*, 2 vols.; *Rabies and Hydrophobia; Animal Plagues; Veterinary Obstetrics;* and founded *The Veterinary Journal.* The *Veterinarian*, a monthly periodical, has been published for many years.

VETERINARY SURGEON (Eng.), an officer of a cavalry regiment, or in the artillery, who is charged with the supervision of the horses, and with their cure, if in need of medical aid. A veterinary surgeon is required to produce proper testimonials of qualification, and to pass an examination. On appointment he receives 10s. a day, and ranks as lieut. By service his pay rises to £1 3s. a day, and his relative rank to that of maj. After 25 years' service he becomes entitled to retire on half-pay.

VETH'AKE, Henry, ll.d., 1792–1866; b. Essequibo, South America; came in youth to the United States; graduated at Columbia college, 1808; studied law; was a teacher of mathematics and geography in Columbia college, 1813; professor of mathematics and natural philosophy Rutgers college, 1813–17; at Princeton, 1817–21; Dickinson college, 1821–29; university of New York, 1832–35; president of Washington college, Va., 1835–36; professor of mathematics, university of Pennsylvania, 1836–54; provost, and professor of mental and moral philosophy, 1854–59; professor of higher mathematics in the Philadelphia polytechnic college, 1859. He published *Principles of Political Economy;* edited *Supplementary Volume of Encyclopædia Americana*, most of the articles of which he wrote; edited and enlarged McCulloch's *Dictionary of Commerce.*

VETIVER, or **Cuscus**, the dried roots of an East Indian grass (*Andropogon muricatus*), which has a very agreeable and persistent odor, something like sandal-wood. It is much prized in India and other parts of the world, and is used to perfume linen, etc. Baskets, fans, and mats are made of it in India; it is remarkable for giving out its perfume for many years, and it is strongest when moistened.

VETO, in politics, the power which one branch of a legislature of a country may have to negative the resolutions of another branch. In the United Kingdom, the power of the crown in the act of legislation is confined to a veto—a right of rejecting, and not resolving. The crown cannot of itself make any alterations in the existing law, but may refuse to sanction alterations suggested and consented to by the two houses of parliament. The necessity for such refusal is generally obviated by an observance of the constitutional principle, that the will of the sovereign is that of the responsible ministers of the crown, who only continue in office so long as they have the confidence of parliament. The royal veto is reserved for extreme emergencies; the last instance in which it was exercised was in 1707, when queen Anne refused her assent to a bill relating to the militia in Scotland. The house of lords will generally support the prerogative of the crown by rejecting a measure repugnant to the sovereign; and a knowledge of this may enable the ministry to defeat it in the house of commons—a result which the constitutional influence of the crown and the house of lords in the lower house may assist in producing, so as to avoid a collision between the branches of the legislature. In bills of supply, the power of the house of lords amounts merely to a veto, as does that of the house of commons in bills affecting the peerage.

In the French constitution of 1791, it was resolved to have but a single house of legislature, on the principle that it was inconsistent with the idea of a legislature representing the national will that one part of it should have a veto on another, and the same view was adopted by the convention of 1793. But the arbitrary and violent measures of that latter body induced a strong general conviction that a division of the legislative power, and a veto in some form, was essential to give stability to the government, and moderation to faction; and in the constitution of 1795, a council of ancients was introduced, with a power to veto the resolutions of the legislative body.

By the constitution of the U. S. power is given the president to "veto" any act of congress by refusing to sign the bill after its passage. If he adopt this course the bill is returned to the house in which it originated with the president's objections to signing it. The house then may proceed to reconsider the act, and if the act pass both branches by a two-thirds majority, it becomes law. A similar power is exercised by the governors of the states under the state constitutions. The U. S. constitution also provides that "if any bill shall not be returned by the president within ten days (Sunday excepted) after it shall have been presented to him, the same shall be a law in like manner as if he had signed it, unless the congress by their adjournment prevent its return, in which case it shall not be a law." This power of the president to prevent the enactment of a law presented to him within the ten days before the adjournment of congress, without sending in a refusal to sign or objections, is commonly known as the "pocket veto." In a few states, a simple majority vote will carry a bill over a governor's veto.

VETO ACT, in Scottish ecclesiastical law. See PATRONAGE; SCOTLAND, CHURCH OF.

VEUILLOT, LOUIS, French journalist and author, b. in 1813, at Boynes en Gatinais (Loiret). The son of a small cooper, he was sent to a school near Paris, from which he was transferred in 1826 to a lawyer's office. He chose the profession of journalism, and filled several engagements on the provincial press, in the course of which his personalities involved him in various duels. He visited Rome in 1836, previous to which, he states, he was without much faith, either religious or political. He returned to Paris, however, a zealous adherent of the papacy, and, as editor of the *Univers*, soon signalized himself as an aggressive and uncompromising champion of the church. In 1842 he accompanied marshal Bugeaud to Africa as his secretary, and on his return was made chief secretary to the ministry of the interior. He again edited the *Univers* in 1848; but his polemical disquisitions brought upon him the censure of the archbishop of Paris; and in 1853 the clergy of the diocese of Orleans were expressly forbidden by their bishop to read the *Univers*, which, after the usual three warnings, was suppressed by the French government in 1861. It was afterward replaced by the *Monde*, in which Veuillot discussed religious matters in a more temperate spirit. In 1862, he published a pamphlet, under the title of *Parfum de Rome*, which was principally devoted to heaping coals of fire on the head of Cavour, and assailing the abbé Passaglia with the bitterest objurgations. He prays, for instance, that "his robe may become a robe of fire," and that Heaven "may refuse him a single tear to temper its burning." In 1867, the *Univers* was revived. Veuillot, besides polemical pieces, has written novels, hymns, and a collection of articles under the title of *Mélanges Religieux, Historiques, et Littéraires* (1857). *Les Odeurs de Paris* appeared in 1866. He became an enemy of all progress, and was latterly a furious Legitimist. He d. 1883.

VEVAY (Ger. *Vivis*), a small town of Switzerland, in the canton of Vaud, remarkable for the beauty of its situation on the north shore of the lake of Geneva, at the mouth of the gorge of the Veveyse, 11 m. e. of Lausanne. From the elevations about the town, the fine view to the e. commands the gorge of the Rhône, backed by the magnificent rampart of the Alps of Valais. In the church of St. Martin (date 1438), Ludlow, one of Charles I.'s judges, and Broughton, who read to him his sentence of death, are buried. An electric railway connects Vevay with the famous castle of Chillon (q.v.), 6 m. to the s.e. The country in the vicinity, especially that between Vevay and Lausanne, is much occupied by vineyards and orchards, and the wines of the vicinity have some reputation. Pop. '88, 25,664.

VEZIN, HERMANN, actor, b. in Philadelphia in 1829; was of German parentage, his father being a noted merchant of that city. He was intended for the legal profession, and received the degrees of B.A. and M.A. from the University of Pennsylvania. Following his inclinations, however, he went to England and obtained an engagement at the Royal theater in York. His London *début* was made at the Princess theater under Mr. Charles Kean's management. Two years later he "starred" through the English provinces. In 1857 he visited the United States professionally, returning to England in 1858. He appeared at the Surrey theater, London, in 1859, in various Shakespearian characters. In 1866 he made a great success in *Dr. Davey*. He won immense applause in 1875 by his impersonation of Jacques in *As You Like It*. He also made a great impression as *Macbeth*. At the Haymarket, London, he played *Daniel Druce* 106 times. He also played as Hamlet, Othello, Shylock, Marc Antony, De Talde in *The Danicheffs*, Dr. Primrose in *Olivia*, etc.

VIA DOLOROSA is a narrow, zigzag street in Jerusalem (q.v.), leading from the eastern or St. Stephen's Gate to the Church of the Holy Sepulchre (see HOLY PLACES), and tradition points to it as the street through which our Saviour carried his cross from the Hall of Judgment to Mt. Calvary. It has borne its present name but a few centuries, and its identity with the road connected with the events of the crucifixion, is generally considered by travelers and scholars to be a myth of the Middle Ages. The traditional part commences at the Palace of Pilate, now used as the Governor's palace. Two arches at this point are said to mark the staircase to the Judgment Hall. Next comes the Church of the Flagellation, said to mark the spot where Christ was scourged, though some say this marks the spot where he was crowned with thorns. Next comes the Ecce Homo Arch, said to mark the place where Pilate stood when he said to the Jews, "Behold, I bring him forth unto you that ye may know that I find no crime in him." Dr. Thompson says "there is not a yard of the walls on either side of this street that existed at the time of the crucifixion, still, the arch is a striking object. It is high, quite round, spanning the entire width of the street, and having an ordinary room on top of it, much dilapidated. It will always attract the attention of the pilgrim and the traveler." The next site marked is said to be where he fainted under the cross; next, where he met his mother, saying, *Salve, Mater!* Next comes a steep, sharp pitch on which he is said to have fainted and fallen the second time; next, the spot where Veronica (q.v.), gave him her veil to wipe away the perspiration; and lastly, the place of the third fall. But since history records the total destruction of Jerusalem by Titus in the first century A.D., we must agree with Dr. Thompson when he says, "that whole street, with all its sacred places, I give up at once, as no plausible evidence can be deduced for the identity of any of the stations."

VIADUCT, a structure for conveying a roadway across a valley or low level, being so called in distinction from an *aqueduct* (q.v.), which is an erection of the same description for the conveyance of water over a hollow. It is in every respect similar to an extended bridge. The great extension of railways within recent years has rendered the use of viaducts much more common than formerly. These are of every kind of construction—of wood, iron, stone, and brick work (see BRIDGE, TUBULAR BRIDGE, LATTICE BRIDGE, etc.). A railway embankment is also a species of viaduct; but the term is limited to those structures which are more or less open, and rest upon piers. A very peculiar example is that over the Moine, near Nantes in France. The piers are all perforated by a pointed arch, which insersects the main cylindrical arches, and forms a groined roof, similar to that of a Gothic cathedral. This viaduct consists of 15 arches, and is 348 ft. in length, and is all built of fine granite.

VIA-MA'LA, a remarkable defile in the canton of Grisons, Switzerland, is a portion of the Hinterrheinthal (see RHINE) which lies between Thusis and Zillis. The sides of the cleft, which is about 2 m. in length, are immense walls of rock, almost parallel to each other, and so hard that the disintegrating influence of the elements appears not to have produced the slightest effect on them, each projection on one side corresponding to an indentation on the other, almost as perfectly as at the time they were separated. The walls have a maximum height of about 1600 ft., and at various parts of the defile are not more than ten yards apart at the top. Far beneath, the Hither Rhine, compressed till it appears to one above like a mere thread, rushes like an arrow through the gorge. The first part of this defile was long deemed quite inaccessible, and had received the name of the Lost Gulf (Fr. *Trou perdu;* Ger. *Verlorenes Loch*), but in 1822 a magnificent road was constructed along the whole length of the defile, from 400 to 600 ft. above the river, by blasting and cutting a "notch" in the side of the rock. The road is necessarily steep and narrow, crosses from side to side of the defile by three bridges, and is protected now by a canopy of rock overhead, and again by a wooden roofing, from falling stones and trees. So narrow is the crevasse in some places, that fallen trunks and stones are often wedged in between its sides at a considerable distance above the ordinary water-level; and on the occasion of the great flood of 1834, the river, which is generally 400 ft. below the second bridge, rose to within a few feet of it, and at the same time carried off the upper bridge.

VIAN'NA DO CASTELLO, a fortified city and seaport in the n. of Portugal, in the province of Minho, stands at the mouth of the Lima or Limia, 40 m. n. of Oporto. It is handsome and clean, with a tolerable harbor, which admits vessels of 150 tons burden; and it carries on considerable trade with Newfoundland in salt-fish. Pop. '90, 9682.

VIARDOT, LOUIS, b. France, 1800; became director of Italian opera in 1839, and brought out Michelle Pauline Garcia, whom he married the next year. In connection with George Sand and Pierre Levoux he established the *Revue Indépendante* in 1841. Among his works, which include several translations from the Spanish, and the Russian of Turgeneff and Pushkin, are *Essai sur l'Histoire des Arabes et des Maures d'Espagne* (1832); and *Les Merveilles de la Peinture* (1868). He d. 1883.

VIARDOT-GARCIA, MADAME MICHELLE PAULINE, vocalist, b. in Paris, France, July 18, 1821, was daughter of the tenor Emanuel Garcia, and sister of Madame Malibran. At four years of age she spoke four languages; at seven she was able to play pianoforte accompaniments for pupils to whom her father gave lessons. She was taken with her family first to England, then to the United States, but in 1828 returned to Europe, and her education was continued at Brussels, Belgium, under care of her mother, her father having died in 1832. She was one of Liszt's most accomplished pupils. Her first London appearance was at the Opera House, in 1839, as Desdemona. At the close of the season she joined the Italian Opera Company then at the Odeon in Paris, and was successful. She married M. Louis Viardot, director of the Paris Italian Opera in 1840, who died in 1883. In 1841 she reappeared in England, next appeared at Vienna, then at St. Petersburg, and Berlin. Her name is associated with the first performance of Meyerbeer's *Les Huguenots* and of *Le Prophete*. Her voice combined the two registers of soprano and contralto. She retired from the stage in 1863; began teaching singing in Paris in 1871; and published several compositions.

VIAREGGIO, a t. of central Italy, in the province of Lucca, close to the shore of the Mediterranean, 30 m. s.e. of Spezia. It is modern, stands in a delightful plain, and has wide straight streets. At the beginning of the present century it consisted of only a few huts; but its healthy, equable climate, and fine situation, have induced many rich families to settle here, and it is growing rapidly. Its sea-baths are much frequented. The vicinity is productive in olives, grapes, etc. In 1892 a monument was erected to the poet Shelley, who was drowned near Viareggio in 1822. Pop. '81, 12,735.

VIATICUM (Lat. *viaticum*, money allowed for a journey), the word applied in the ancient as well as modern ecclesiastical terminology to the communion administered to dying persons, which, in the case of the great journey to eternity, is thus quaintly likened to the money-provision made for a journey upon earth. The special ministration of the eucharist to the dying is very ancient (see LORD'S SUPPER); it was the one exceptional case in which, during the times of rigorous canonical penance, the penitents were admitted to the communion before the completion of the appointed cycle of penance.

By the modern practice of the Roman church, it is permitted to the sick, to whom the eucharist is administered in the form of the viaticum, to receive it, although not having fasted (as is required in all other cases) from the midnight previous. The viaticum may be given frequently during the same sickness, at intervals anciently of ten or seven days, but, by the modern practice, even daily, should it be earnestly desired by the sick person. The priest is ordered to bring the sacred elements from the church to the dying person at any hour, whether by day or by night, when he may be called on for this last service of religion. Protestants reject the very idea of a *viaticum*, and regard the administration of the Lord's supper in that character as superstitious.

VIATKA or VYATKA, a government of the e. of European Russia, bounded on the e. by the governments of Perm and Orenburg, and on the s. by that of Kazan. Area, 59,235 sq. m., pop. '94, 3,120,424. The surface consists for the most part of marshes and sandy plains, varied here and there by hills. The soil, fertile only in the southern districts, is mostly a mixture of sand and clay. In the s., agriculture is effectively carried on, wheat, rye, barley, and oats being produced in abundance, as well as flax and hemp, which supply materials for the linen manufactures. The principal rivers are the Viatka and Kama (navigable throughout the whole year), and their affluents. Owing to the number of navigable streams, and to the well-regulated land communications, the traffic of the government is successfully carried on. Horses of a fine breed are reared, but the principal source of the wealth of Viatka is its timber. Iron-works, distilleries, tanneries, and glass and cotton factories are in operation.

VIATKA, a t. of Russia, capital of the government of the same name, on the river Viatka, 280 m. n.e. of Nijni-Novgorod. It was founded by the inhabitants of Novgorod, and was annexed to the Muscovite dukedom in 1489. It has over 20 churches, 2 convents, a public library and museum. The chief branches of industry are the preparation of skins and the manufacture of tallow and wax-candles. Pop. '94, 24,615.

VIAUD, LOUIS MARIE JULIEN, was born at Rochefort, France, Jan. 14, 1850, educated at the Borda school, and admitted into the navy in 1867. He was in the Oceanica, Japan, Senegal, and Tonkin campaigns, and was appointed a lieutenant in 1881. In 1883 the Paris *Figaro* printed a series of letters descriptive incidentally of cruelty at the assaults on the forts of Hué by French soldiers. They were signed "Pierre Loti." The government declared them untrue, unpatriotic, and unbecoming an officer, and condemned Lieut. Viaud to be suspended for a year. They made the writer famous. Viaud wrote, in 1879, *Azivadé;* in 1881, *Rarahu*, reprinted as the *Mariage de Loti*, and the *Roman d'un Spahi*. He wrote, in 1885, *Fleurs d'Ennui*, *Pasquala*, *Ivanovitch*, *Suleima*. But these and the best work of Loti, *Mon Frère Yves*, published in 1883, might have passed unnoticed, except by men of letters, if it had not been for the *Figaro* affair. In 1884 appeared the *Trois Dames de Kasbah;* in 1886, *Le Pêcheur d'Islande;* in 1887, *Mme. Chrysanthème* and *Propos d'Exil;* in 1889, *Japoneries d'Automne;* in 1890, *Au Maroc;* in 1892, *Fantôme d'Orient;* in 1893, *Matelot;* in 1895, *Le Désert;* in 1896 *La Galilée* and *Jérusalem;* in 1897, *Ramuntcho*. In 1891, he was elected to the French Academy.

VIAZMA, a t. of Great Russia, in the government of Smolensk, and 152 m. e. of Moscow, on the Viazma. It is first mentioned in 1239, and, after being owned successively by the Lithuanians and Poles, it finally became Russian in 1634. In 1812, after a bloody battle between the Russian and French armies, in which the former was victorious, Viazma was demolished, and there are now hardly any remains of the old town. It carries on an active trade in corn, flax, hemp-seed, tallow, etc., and is the entrepôt for goods exported to St. Petersburg and Riga. Viazma gingerbread is exported to all parts of the empire. Pop. '93, 16,791.

VIBERT, JEHAN GEORGES, a French portrait and genre painter, both in oils and water-colors, was born at Paris in 1840, studied under Picot and Barrias, and became a chevalier of the Legion of Honor. Among his works, some of which satirize the clergy, are, *The Christian Martyrs among the Lions*, *Daphnis and Chloe*, *The Comedy*, and *Committee on Moral Books*. He wrote a number of plays and monologues, and published *La Science de la peinture* (1891).

VIBI'CES. This term is applied in medicine to patches on the skin, varying in tint from bright red to violet, which occur in certain diseased conditions of the blood, and especially in purpura. They are caused by minute hemorrhages of the capillaries of the true skin. The word is a Latin one, being the nominative plural of *vibex*, *-icis*, the mark of a stripe.

VIBORG, a län of Finland, Russia, having the gulf of Finland for its s. boundary; area, including numerous small islands off the coast; 16,510 sq. m.; pop. '87, 330,823. It contains a part of lake Ladoga and lake Saima. Agriculture is not highly developed, but oats, rye, barley, flax and hemp are raised to some extent. There are numerous manufactories, of glass, porcelain, gunpowder, paper and metal ware, and a heavy trade in timber. It contains a strong fortress at Frederickshamn, on the bay of Finland, where the treaty of 1809 was concluded between Russia and Sweden, in which Finland with Lapland and the Aland islands was made over to Russia. Capital, Viborg.

VI'BORG, the oldest city in North Jutland, and one of the oldest in Denmark, on a small lake, 25 m. w. of Randers. Its most important building is the cathedral, originally founded in the 12th c., and magnificently restored in 1864–76. Pop. '90, 8352 engaged in the manufacture of woolen fabrics, leather, and tobacco.

VIBRATO, an Italian term denoting an effect similar to tremolo. On stringed instruments it is produced by the quick oscillation of the hand while the finger is stopping a note. A kind of trembling sound is made. In vocal music it is a partial suppression and reinforcement of a note, producing an apparent reiteration.

VIBRION'IDÆ, a family of microscopic organisms, which derive their name from their darting and quivering motion. They are allied to the Bacteria (q. v.), from which they differ in being jointed. It has been debated whether they are animal or vegetable. See GENERATION, SPONTANEOUS: also GERM THEORY.

VIBURNUM, a genus of plants of the natural order *caprifoliaceæ*, having a 5-toothed calyx, a 5-lobed, wheel-shaped, bell-shaped, or tubular corolla, 5 stamens, 3 sessile stigmas, and a one-seeded berry. The species are shrubs with simple leaves, natives chiefly of the northern parts of the world. *Viburnum opulus* is the guelder rose (q.v.), or snowball tree, and *viburnum laurustinus* is the laurustinus (q.v.), both well-known ornamental shrubs. *Viburnum lantana*, sometimes called the WAYFARING TREE, is a native of the warmer temperate parts of Europe and Asia, not unfrequent in England, and often planted as an ornamental shrub. It is a large shrub or low tree, with large elliptic serrated leaves, downy, with star-like hairs on the under side. The young shoots are very downy. The flowers are small and white, in large dense cymes; the berries purplish black, mealy, and mucilaginous, with a peculiar sweetish taste, disagreeable to many, but relished by some. They are useful in diarrhea and catarrh. Birdlime is made from the roots in the s. of Europe. The inner bark is very acrid, and was formerly used as a vesicant. The wood is white and hard, and is prized by turners. Tubes for tobacco-pipes are made of the young shoots.—Two North American species, *viburnum edule* and *viburnum oxycoccus*, nearly allied to the guelder rose, produce berries of an agreeable acid taste, which are used like cranberries. See illus., BOTANY, vol. II.

VICAR (Lat. *vicarius*, from *vicem*, i.e., *gerens*, acting in the place of another), the title given to the substitute, whether temporary or permanent, employed to act in the place of certain ecclesiastical officials, whether individuals or corporations; as of the pope, a bishop, a chapter, a parish priest, etc. Vicars take different names from these various considerations. Vicars of the pope are called "vicars-apostolic," and they are generally invested with episcopal authority, in some place where there is no canonical bishop. Vicars of a bishop are either "vicars-general," who have the full authority of the bishop all over his diocese, or "vicars-forane" (Lat. *foraneus*, from *foris*, abroad), whose authority is confined to a particular district, and generally otherwise limited. A vicar-capitular is the person elected by the chapter of a diocese, during the vacancy of the see, to hold the place of the bishop, and to exercise all the authority necessary for the government of the diocese. The vicar-capitular, however, is not competent to do any act of episcopal order, as ordination, confirmation, etc. His power is restricted in other ways which it would be out of place to detail here. Parochial vicars are either perpetual, as in parishes which were anciently held *in commendam* (q.v.), or which were held by religious corporations; or temporary, whose appointment may be recalled at pleasure, or after a fixed time. The name, in this sense, is sometimes given, especially in the Roman Catholic church, to the assistant-priest, or as he is called in England, the curate, in a parish. The functions of "vicars-apostolic" are described under the head IN PARTIBUS INFIDELIUM.

VICE, SOCIETIES FOR THE SUPPRESSION OF, are organizations formed mainly "to suppress and repress evils which especially attack the morals of the young—obscene, indecent, and criminal books and pictures and papers, articles for indecent and immoral use, and all kinds of gambling." They have full power to enforce the laws, to prosecute offenders, and to destroy their stock.

VICE-ADMIRAL. See ADMIRAL and FLAG-OFFICER.

VICE-CHAMBERLAIN. See CHAMBERLAIN, LORD.

VICE-CHANCELLOR, a judge in equity, appointed by the crown under letters-patent to assist the lord chancellor of England. The title and functions are at least as old as the reign of Henry II.; but the office long fell into disuse, and was revived by statute 53 Geo. III. c. 24, appointing one vice-chancellor; act 5 Vict. c. 5, s. 19, afterward appointed two more, on the abolition of the equitable jurisdiction of the court of exchequer. The office is ancillary to that of the lord chancellor, for whom the vice-chancellor is empowered to act in his absence, besides being entitled to hold separate courts.

The vice-chancellor of a university is an officer who is empowered to discharge certain duties of the chancellor, chiefly those connected with granting degrees, in his absence.

VICE-CONSUL, a subordinate officer, to whom consular functions are delegated in some particular part of a district already under the supervision of a consul. A British vice-consul is selected by the consul under whom he is to act, and his name is transmitted for approval to the secretary of state for foreign affairs. If he is approved of, the consul is directed to furnish him with authority to act, and to impart to him instructions similar to what he himself has received from the foreign secretary. The vice-consul acts

under the general supervision of the consul, corresponding with him in ordinary cases, but in some special cases with the foreign office. A consul is not at liberty to dismiss a vice-consul acting within his district without the sanction of the foreign secretary; but if of opinion that sufficient grounds for the dismissal exist, his duty is to give information to the foreign secretary, suspending the vice-consul in the mean time, if the circumstances be urgent; and in all cases awaiting the decision of the foreign secretary before taking ulterior steps. Regarding U. S. vice-consuls, the general usage is the same.

VICE-PRESIDENT, an officer of the U. S. government, whose official function consists in presiding over the senate, where he can vote only in case of a tie, and who succeeds to the presidency upon a vacancy in the latter office. He is elected with and in the same way as the president; and if there has been no election of a vice-president by the electors, a majority vote in the senate, if there be a quorum of two-thirds present, will elect him. In the absence of such a majority he is elected from the two candidates receiving the largest senatorial vote. His salary is $8000.

VICENNIAL PRESCRIPTION, in the law of Scotland, is the limitation which is put to certain actions after the lapse of 20 years, such as actions by heirs to reduce an erroneous retour.

VICENTE GIL. See Gil, Vicente.

VICENZA, a province in n.e. Italy, adjoining the Tyrol, drained by the Brenta and the Bacchiglione rivers; about 1000 sq. m.; pop. '93, 440,191. The surface is generally level, except in the n. where it is intersected by ridges from the Alps. There are large forests. The soil in the level districts is fertile. The chief productions are cattle, silk, and wool. Coal is found. There are extensive manufactures. Capital, Vicenza.

VICENZA, a handsome city of Venetia, beautifully situated at the confluence of the Bacchiglione and Retrone rivers, 42 m. w. of Venice by railway. The rivers are crossed by numerous bridges, one of which, a bold, single arch, is attributed to Palladio, who was a native of the city, and to whose genius it is much indebted for its beauty. Vicenza is surrounded by a moat, and walls half in ruins, and contains many fine palaces and churches. The Piazza dei Signori, a remarkably fine square, contains the Palazzo della Ragione or town-hall, an early building in the pointed style, surrounded by the Basilica Palladiana, a beautiful colonnade in two stories, with a slender campanile over 265 ft. high. The Palazzo Prefettizio, also by Palladio, is a rich and fanciful Corinthian edifice. The Duomo, built in 1467, is Gothic; the nave of it is 60 ft. wide; and in certain of the chapels are interesting pictures. The Teatro Olimpico, the scenery of which is fixed, and represents a species of piazza, with diverging streets of real elevation, but diminishing in size, is by Palladio. Vicenza contains a lyceum, a seminary, and a picture gallery; an extensive library, and a hospital, and many benevolent institutions. Manufactures of silk, linen, earthenware, paper, and velvet are carried on. The surrounding country, studded with mansion-houses, and rich in vineyards, is exceedingly beautiful. Pop. '95, commune, 41,200.

Vicenza (anc. *Vicentia*, or more correctly, perhaps, according to inscriptions, *Vicetia*) is a very ancient city. An inscription records its existence in 136 B.C., and it continued to be a municipal town of some consideration, till it was laid waste by Attila, 452 A.D. It revived again under the Lombards, and became for a time, in the middle ages, an independent republic.

VICEROY (Lat. *vice*, in place of, and Fr. *roi*, king), a title popularly given to any officer who is delegated by a sovereign to exercise regal authority in his name in a dependency, as the lord-lieutenant of Ireland—who, however, is never officially so styled. It was the proper official designation of the governors of Naples, Spain, and Peru, under the old Spanish monarchy. See Khedive.

VICH, or Vique, a city of Spain in Catalonia, modern province of Gerona, on a hill-girt plain about 38 m. n. of Barcelona. Its cathedral, built about 1040, but repaired and modernized about the end of the 18th c., is bold and elegant in the interior, and the Gothic cloisters are of the most rich and elegant description. Corn, fruit, and a bad wine are the products of the vicinity; and the inhabitants are employed in weaving, and in the manufacture of hats and paper. Pop. '87, 11,640. Vich, the Roman *Ausa*, was afterward called *Ausona* and *Vicus Ausonensis*, of the first part of which its present name is a corruption.

VICHY, a small t. of the interior of France, in the department of Allier, stands on the Allier, in a fine valley, surrounded by hills clad with vines and fruit trees, 32 m. s.s.e. of Moulins. Pop. '91, commune, 10,870. Vichy is the most fashionable bathing resort in France. The springs which rise at the foot of the volcanic mountains of Auvergne (q.v.) are of the alkaline class, and the most efficacious of the kind that are known. They vary in temperature from 68° to 112° Fahr., and are used both for drinking and bathing. They are resorted to in cases of indigestion, chronic catarrh, gout, etc. See Mineral Waters.

The virtues of the *aquæ calidæ* of this place were known in Roman times, as is testified by the numerous remains of marble baths and coins of the times of Claudius and Nero that have been dug up; but their modern repute arose only in the present century.

VICIA. See Vetch and Bean.

VICKSBURG, city, port of entry and delivery, and co. seat of Warren co., Miss.; on the Mississippi river, and the Queen and Crescent route and the Yazoo and Mississippi Valley railroads; 45 miles w. of Jackson. It was settled in 1836 by a family named Vick, and was incorporated in 1840. It was strongly fortified in 1861, after the adoption by the state of the ordinance of secession, and was provided with a large garrison, which refused to surrender at the demand of a portion of Farragut's fleet, May 18, 1862, and the fortifications and city were taken only after a long siege, as related in the article following. The efforts of Gen. Grant to change the river channel by cutting a canal across a peninsula in front of the city, failed for the time, but in 1876 the river broke through at that point, forming De Soto island and Centennial lake. Since then extensive operations have been carried on by the U. S. government to prevent further erosion on the Louisiana bank and to provide a permanent channel for the river, with the view of restoring navigable water to the city front. The city is built upon the Walnut Hills, a high range extending through the Yazoo valley, and presents a very picturesque appearance from the Mississippi.—It is regularly laid out and contains some handsome buildings, the court-house in particular, but the older streets are narrow. It is the chief commercial point, especially for cotton, between Memphis and New Orleans, and is connected with those ports and with St. Louis by lines of packets, as well as by rail. Besides baled cotton it ships large amounts of cotton-seed oil, oil-meal, and oil-cake, and its manufactures include machinery, cars, boilers, lumber, sashes, doors and blinds, iron, carriages, and shoes. It has a U. S. government building, co. court-house, the Charity hospital, high, grammar, and parochial schools, national and state banks, gas and electric lights, waterworks on the high pressure system, extensive railroad shops, daily, weekly, and monthly periodicals, and, in the suburbs, a national cemetery, where 17,000 union soldiers are buried. Pop. '90, 13,373.

VICKSBURG, SIEGE OF. In the early months of 1863, to capture Vicksburg, the last remaining fortress of the confederates on the Mississippi, and thus to re-open this great river, in its entire length, for all national purposes, was an enterprise scarcely less difficult than important. Hence the concentration, for many months, of naval and military forces to subdue this stronghold. The unsuccessful attempts to reduce the fortifications by bombardments from the iron-clads in the river, and to change the river channel, leaving the city far inland, compelled the conviction that Vicksburg could be captured only by land forces approaching from the rear. Supported by this change in public opinion, Gen. Grant moved down the w. bank, and crossed the river at Bruinsburg, April 30. Following his own plan, he first advanced upon Jackson, where the confederate armies were concentrating under Gen. Johnston. Quickly dispersing these gathering forces, May 14, he destroyed the centring railroads, and left the confederates no means of reorganization. Returning then to his original purpose, Gen. Grant invested Vicksburg so closely that there was no escape, and cannonaded the fortification and the town so fiercely and incessantly that endurance was impossible. The garrison and the people were driven to the last extreme of suffering when this terrific day-and-night siege of six weeks was terminated by a complete surrender, on the same day that witnessed the equally memorable and hard-fought three-days' battle of Gettysburg—July 4, 1863. The union loss was reckoned at 10,000; the confederate loss at about the same, besides the surrender of over 31,000 men and 172 cannon.

VICO, GIAMBATTISTA (or GIOVANNI BATTISTA), a jurist, philosopher, and critic, was born at Naples, 1668, spent the whole of his life in that city, and died there in 1744. He was the son of a small book-seller. He was educated by the Jesuits, and afterward studied for the bar. Weak health preventing him from following his profession, he became tutor in jurisprudence to a nephew of the bishop of Ischia; and after filling this position for nine years, he obtained the chair of rhetoric in the university of Naples. This office was poorly paid; but though much distinguished by persons of the highest position, Vico did not succeed in getting a better one until the accession of the Bourbons, 1735, when he was appointed historiographer to the king of Naples. As he married early, and had a large family, his life was passed in great poverty, and it was, moreover, imbittered by family troubles, and by constant ill-health The great work which has made his name illustrious, the *Scienza Nuova*, first appeared in 1725; but it was completely recast in a subsequent edition, published in 1730, with the effect of making it more imposing as a system, at the expense of a great loss of clearness. A third edition, in which the work was considerably enlarged, was published in 1745, shortly after the author's death. In the *Scienza Nuova*, Vico brought together, and attempted to fuse into a system, opinions which he had previously advanced in a somewhat numerous series of separate treatises. The work was long in arriving at its proper place in European literature, which must be in a great measure attributed to its obscure and enigmatical style. Much of the obscurity arises from the use of an uncouth terminology, which the author often leaves unexplained, and (in the case of the later and authoritative editions) from the rigorous application of the deductive method to subjects which do not always admit of it. The *Scienza Nuova* was virtually unknown out of Italy in 1822, when a German translation of it appeared at Leipsic. It was, a few years later, translated into French (with some curtailment) by M. Michelet (*Principes de la Philosophie de l'Histoire, traduits de la "Scienza Nuova" de G. B. Vico;* Paris, 1827); and the author has since that found his proper rank among the most profound of modern thinkers.

The *Scienza Nuova* (*De' Principj della Scienza Nuova d' intorno alla Commune Natura delle Nazioni*) may be described as a *Novum Organum* of politico-historical knowledge. Observing, amid the infinite variety of thoughts and actions, of language and manners,

which the history of nations presents, a concurrence of the same characteristics, in the political changes which peoples the furthest removed from each other in time and place have passed through, an essential similarity of development, Vico proposed to himself the task of distinguishing amid social phenomena the regular from the accidental; of finding out the laws which govern the formation, the growth, and the decay of all societies; in fine, of tracing the outlines of the universal, the ideal history of society—the idea of which he himself believed to have existed from eternity in the mind of God. In doing this, he attempted, by means of historical criticism on the widest basis to illustrate the inter-dependence of all the sciences; to show that the progress of each of them is related to that of all the others, and the progress of all of them dependent upon, while also acting powerfully upon the general condition of society. And while holding that the actual state of every society is the result of a free development of the human faculties, he attempted to give a historical demonstration of the existence of a Divine Providence directing the career of nations, overruling the designs which men propose to themselves; operating, however, not by positive laws, or arbitrary interferences, but by means of methods and expedients which men resort to freely. It has been not inaptly said that the *Scienza Nuova* includes a system of social (as distinguished from natural) theology—a demonstration of God's government of the world, and of the laws in which that government consists. Vico, in these inquiries, accepted from Descartes the individual consciousness as one of the criteria of truth; but he also employed another—the collective consciousness, or the common sense of mankind—the accord of the race, as it may be gathered from history—in a word, authority.

It would be difficult to overrate the ingenuity and originality of many of the inquiries into which Vico was led by the attempt to delineate the ideal history of society; and he has rarely failed to put forward views, rational and probable, compared with those which were accepted among his contemporaries. With a truly admirable insight, he has not seldom hit upon the conclusions to which increased social knowledge and more scientific conceptions have conducted inquirers of later generations. Thus, in clearing the ground for the foundation of his system, he was led to precisely those views about Homer and the authorship of the Homeric poems which are popularly associated with the name of Wolf; and to anticipate the general view of the credibility of early Roman history which was elaborated by Niebuhr.—(See also Comte, the germs of many of whose speculations may be found in Vico). The beginnings of religion, the origin of poetry and language, the commencement of society (which he ascribes to the influence of a common religious belief and worship), the foundation of the privileges of the heroic or aristocratic class, are among the earlier subjects of his speculation. He proceeds to trace the origin of jurisprudence, and to show how its development has been dependent upon social changes; and he afterward deduces from the history of ancient societies, and, in some degree from the history of the governments which sprung out of the ruins of the Roman empire, the laws which govern the progress, the conservation, and the decay of nations. A monarchy, with an equality of civil and political rights as between subjects, was his ideal of good government for advanced societies.

Though he ascribed to religion a paramount influence in forming and in conserving society, and though it was one of his principal objects to demonstrate the divine government of the world, Vico did not escape the suspicion of having written in a spirit of hostility to religion. It was alleged that he had written so obscurely, as he often did, through the fear of incurring ecclesiastical censures. Some critics of another school charged him, with at least equal plausibility, of having striven, both in his particular doctrines and in his consecration of the principle of authority, to satisfy the Roman Catholic church. The cavils made on either side, however, do not seem deserving of much attention; and it is pleasant to know that Vico, though not unconcerned about the accusations made against him, felt in his later years consoled for the many trials and disappointments of his life by the completion of a work, the greatness of which he knew better than any of his contemporaries. In 1818 the marquis deVilla Rosa published a collection of the whole of Vico's works. A second edition appeared in 1835.

VICTOR, Claude Perrin, Duke of Belluno, and Marshal of France, was born, Dec. 7, 1764 at La Marche, in the department of Vosges, and at the age of 17 enlisted as drummer in a regiment of artillery. He received his discharge after eight years of service as a common soldier; but re-enlisted in 1792, and having fortunately attracted the attention of Napoleon by his able conduct at the siege of Toulon, 1793, was promoted, through his influence, at the close of that year. In the Italian campaigns of 1796–97, and 1799–1800, he commanded the vanguard, and aided by the favor of Napoleon, who threw opportunities in his way, displayed great skill and extreme daring on numerous occasions. At Marengo he maintained such an obstinate resistance for eight hours to the overwhelming numbers of the enemy, that the expected re-enforcements had time to arrive, and convert the imminent victory of the Austrians into a crushing defeat. In 1806 he commanded, with distinction, a *corps d'armée* in the Prussian and Russian campaigns, and though captured in 1807 by Schill's partisans, he was exchanged (for Blücher) in time to win on the bloody field of Friedland, the baton of marshal of France, and the title of duke of Belluno. As governor of Berlin, he gained the esteem of the Prussians by his dignity and moderation; and in 1808 he was sent to command

the first corps d'armée in Spain. Here he gained several victories, notably over Blake at Espinosa, and Cuesta at Medellin; but was defeated by Wellington in the obstinate battle of Talavera (q.v.), and again by sir Thomas Graham at Barrosa (q.v.). After a fruitless blockade of Cadiz he was recalled to command the ninth corps d'armée in the Russian campaign of 1812; and though occasionally defeated in his many contests with the Russians his general conduct and success were worthy of his previous high reputation. When the allies, in overwhelming numbers, were closing round France, Victor appeared prominently in the fore-front of the defense, made a valiant stand at the passes of the Vosges, and retook St. Dizier and Brienne at the point of the bayonet; but his neglecting to occupy the bridge of Montereau was a fault which Napoleon could not pass over, and he was deposed in favor of Gérard (q.v.). Notwithstanding this disgrace he persisted in continuing with the army, and his zeal for his country suffered no diminution, as his energetic conduct at subsequent minor combats, and at the battle of Craonne, sufficiently proved. A severe wound which he received at this last battle brought his military career to a close; and had it chanced to be mortal, the character of Victor would have stood out in bold relief on the page of history as an able soldier, a faithful friend and follower, and a sterling patriot. But though not mortal, in a physical sense, it brought death to his hitherto spotless reputation; for the sickening ardor of his professions of loyalty to the Bourbons, and his vile calumniations of the now fallen chief, to whom he wholly owed his rise, displayed the foulest ingratitude. Victor's servile attachment to Louis XVIII., however, gained him a peerage and other honors; but the readiness with which he accepted the presidency of the military commission appointed to try such of his old companions in arms as had deserted to Napoleon during the "hundred days" brought upon him merited obloquy. His subsequent career requires but brief notice. He was minister of war in 1821–23; second in command in the Peninsula in 1823; and was afterward accredited as ambassador to the court of Vienna. The Austrian court refused to receive him unless he laid aside his ducal title; and this question of etiquette attracted so much attention, and gave rise to so much vehement discussion that the good understanding of the two countries was for a time endangered. After this event, Victor took no part in public affairs, and died at Paris, Mar. 1, 1841.

VICTOR-AMADEUS, the name of three sovereigns of the house of Savoy.—Victor-Amadeus I., duke of Savoy, succeeded his father, Charles-Emanuel the great, in 1630, and carried on the war with France; but in 1631 he was forced to surrender Pignerol, La Perouse, Angrone, and Luzerne to France, in exchange for Montferrat and Alba. He paid great attention to the internal improvement of his dominions, and re-established the university of Turin on an extended scale; but the irresistible pressure exercised on him by Richelieu forced him into a war with the Spaniards in Italy; and after routing his opponents at Tornavento (1636) and Montebaldone (1637), he died at Vercelli, Oct. 7, 1637.—Victor-Amadeus II., grandson of the preceding, and one of the most able of princes, was born May 14, 1666, and succeeded his father, Charles-Emmanuel II., in June, 1675. Till 1680 the administration of government was in the hands of his mother, Marie Françoise of Nemours, who, in spite of the pressure of France on one side and Austria on the other, succeeded in preserving a neutral attitude in the quarrels between her two powerful neighbors. In 1684 Victor-Amadeus married Anne-Marie of Orleans, the niece of Louis XIV.; but the overbearing insolence of the "Grand Monarque," who forced him to persecute the Waldenses (q.v.), and arrogantly ordered him to contribute an auxiliary force to the French army and give up the citadel of Turin, roused the ire of the high-spirited young duke, speedily put an end to the good understanding which would naturally have accompanied their intimate relationship, and drove him into a league with Austria and Spain against France. In revenge, a French army under Catinat assailed Victor-Amadeus's dominions, and though he was re-enforced by 4,000 Austrians under his relative, prince Eugene, the allies were completely routed at Staffarda (Aug., 1690), and the victorious Catinat had completed the reduction of Savoy and Nice before the winter of 1691. The duke, aided by considerable re-enforcements from Austria and Spain, gallantly maintained the contest; but a second and more disastrous defeat at Marsaglia (Oct. 4, 1693), where he left 10,000 dead on the field, put almost the whole of Piedmont at the mercy of the French. The war, however, continued; the duke's obstinacy and almost romantic daring balancing Catinat's high military genius; till in the autumn of 1696 a treaty much more favorable to Savoy than to France detached the former from the grand alliance. When the quarrel respecting the Spanish succession (see Succession Wars) broke out, Victor-Amadeus took part with France—an alliance cemented by the marriage of his second daughter, Louisa Gabriele to Philip of Anjou, the new monarch of Spain, as well as by the previous (1697) marriage of his eldest daughter (the mother of Louis XV.) to Louis, duke of Burgundy, Louis XIV.'s grandson—and was appointed commander-in-chief of the combined armies of France and Spain; but though he was aided by the counsels of his old opponent Catinat, the Austrians, under his former ally, prince Eugene, defeated him at Chiari (Nov., 1701), and drove him behind the Oglio. Two years afterward, the successes of Vendome in Italy and Villars in Germany, by bringing more prominently before his imagination the possibility of having the Bourbons for his neighbors on the e. as well as on the w., along with the tempting offers of Austria and Britain, induced him to abandon France and

join the alliance against her. In revenge for what they called the duke's treachery, the French under Vendome overran and devastated Piedmont; but with the recall of their chief, fortune deserted the French, and they were totally routed by the duke and prince Eugene under the walls of Turin, Sept. 7, 1706. The duke, who had some years before retired from this contest, was rewarded by the treaty of Utrecht (1713) with the rest of Montferrat, Val-Sesia, Lomellino, and the island of Sicily, with the title of king; besides being acknowleged as heir to the Spanish throne in case of the failure of the Bourbon dynasty. In 1720 he was made to surrender Sicily to the emperor in exchange for Sardinia. The latter portion of Victor-Amadeus's long reign was wholly free from foreign strife; and his restless energy was employed in improving the system of administration, thoroughly assimilating the new continental acquisitions, in replenishing the treasury, which, in spite of the British subsidy, had been drained by the long contest with France, and in encouraging agriculture and industry, especially the cultivation of mulberry trees and tending of silk-worms. Reforms and improvements were effected in the university of Turin, and several colleges founded. On Sept. 2, 1730, the king abdicated; but attempting, in the following year, to resume the regal dignity and functions, he was arrested and imprisoned. He died at the château of Moncalieri, near Turin, Oct. 31, 1732.—VICTOR-AMADEUS III., grandson of the preceding, succeeded his father Charles-Emmanuel III. in 1773. His reign was full of misfortune and disaster, and was brought to a close by his death in 1796 after the compulsory cession of Savoy and Nice to the French republic.

VICTOR-EMMANUEL I. (Ital. *Vittore-Emanuele*), King of Sardinia, the second son of Victor-Amadeus III., was born July 24, 1759, and till his accession bore the title of duke of Aosta. He was one of the most determined adversaries of the French revolution; and on the outbreak of war in 1792, he was chosen to command the Sardinian army, repulsed the French at Gillette, and forced his way to the mouth of the Var, but was ultimately compelled to seek shelter among the Alps. He opposed himself strongly to the conclusion of peace with France in 1796; and from this time lived in southern Italy, and afterward at Cagliari, whence he did not return to Turin till 1814. He had assumed the royal title on his elder brother's abdication in 1802; and the treaty of Paris restored to him Piedmont, Nice, and the half of Savoy in 1814; the treaty of 1815 added the remainder of Savoy, while the congress of Vienna presented him with the duchy of Genoa —so that the little kingdom had profited territorially by its troubles. But the loyal delight of the Savoyards and Piedmontese at the return of their legitimate ruler was speedily quenched by the first acts of his administration. The French institutions to which they had been long enough accustomed to feel their immense superiority over the system they had supplanted, were abolished, and the old absolutism gradually restored. This change, which was no doubt to a certain extent effected by way of destroying all trace of French domination, by depriving the people of various important privileges and amenities, restoring old and hated abuses, and increasing taxation, excited wide discontent, which was heightened by the odious religious persecutions of the Vaudois and the Jews; secret societies were formed, and on Mar. 10, 1821, a revolution broke out. The army proclaimed the constitution promulgated by the Spanish Cortes in 1812; and the king, rather than take the oath to it, resigned in favor of his brother, Charles Felix, Mar. 23, 1821. He died at Moncalieri, near Turin, Jan. 10, 1824.

VICTOR-EMMANUEL II., the first king of a united Italy, was the son of Charles-Albert (q.v.) of Sardinia, and was born Mar. 14, 1820. He was a pupil of the Jesuits, but under his father's superintendence received an excellent education; and, being heir to the throne, he commanded, in accordance with an old custom of his house, the brigade of Savoy in the campaign of 1848–1849, and displayed great gallantry at Goito and Novara. On the evening of the latter battle, his father, seeing the hopelessness of the struggle, and unwilling to bow to the onerous conditions offered by Radetsky, abdicated in favor of Victor-Emmanuel, who, being the husband of the archduchess Adelaide (the cousin of the Austrian emperor) and uncommitted to the views of the Italian ultra-democrats, might hope to obtain more favorable terms from the victor. Victor-Emmanuel thus ascended the throne of Sardinia, Mar. 23, 1849, and restrained effectually, for a time, the enthusiasm of the more ardent among the national party, though, on the other hand, he maintained, with the utmost fidelity, the provisions of the liberal constitution granted by his father. He made a happy choice of ministers in such men as Cavour, D'Azeglio, etc., whose policy it was to increase the strength and importance of the country by improved administration, rigid economy in the finances, care of the army, and encouragement to trade by the conclusion of commercial treaties with foreign nations. They saw too clearly that, despite the intense and almost unanimous desire for unity throughout Italy, a contest single-handed with Austria was utterly hopeless, and preferred, till a more convenient season, to seem to renounce all idea of any such project. The property of the state was sold, and various measures calculated to greatly diminish the privileges, and restrict within moderate limits the inordinate influence of the clergy, adopted—changes which brought upon the king the thunders of the Vatican; but Victor-Emmanuel, nothing daunted, protested by a vigorous "memorandum," and more obstinately asserted and maintained his independence of the papacy. The revolt at Genoa was sternly suppressed; but the king and his ministers were, in secret, by no means displeased to see that the feeling of nation-

ality was still vigorous; for, following the traditional policy of the house of Savoy, he was only biding his time to "descend with the valley of the Po," and swallow "another leaf of the artichoke." With the view of improving his position in Europe, and gaining a place at its council-board, he sent an army of 17,000 men, under La Marmora, to take part in the Crimean war on the side of Turkey; and visited (1855) in person the courts of Paris and London, being received by French and English with great enthusiasm. After the peace of Paris (1856) he entered into a closer alliance with France, gave his elder daughter Clotilde in marriage (Jan. 30, 1859) to prince Napoleon, and, backed by the French arms, provoked a war with Austria. The campaign was brief but decisive—the Austrians were routed in every battle, and the Italians were hailing with exultation the near approach to fulfillment of their long-cherished dreams of unity, when the suddenly concluded peace between France and Austria at Villa-Franca dashed their hopes to the ground. The Milanese (minus the fortresses of Mantua and Peschiera) only was to the Sardinian monarchy, and for this the king ceded Nice and Savoy (the cradle of his race) to France as the price of its alliance. But the people of central Italy refused indignantly the offer of prince Napoleon as their sovereign; and Tuscany, Modena, Parma, and the Romagna, renouncing their allegiance to their respective sovereigns, voted for annexation to Sardinia, and were formally adopted by Victor-Emmanuel, as his subjects. This was a greater advance toward the unification of Italy than the French emperor wished, and accordingly, Victor-Emmanuel, who was still dependent on his ally for safety, though secretly favorable to Garibaldi's expedition to Sicily, disavowed all knowledge of this project, and after the island was conquered without a blow being struck by a single Sardinian soldier, forbade the "Italian liberator" to pass over to the continent; yet he subsequently, with the consent of Napoleon III., sent an army to aid Garibaldi in conquering Naples, and formally accepted the sovereignty of the Two Sicilies. But in 1862 Garibaldi, thinking that the conquest of Rome in the same way would be equally acceptable to his sovereign, returned to Sicily, raised an army of volunteers, and was rapidly advancing on the ancient capital, when Victor-Emmanuel, forced by France, put an end to the expedition by capturing Garibaldi and his army at Aspromonte. Though proclaimed by the senate and house of deputies *king of Italy* in Feb. 1861, Victor-Emmanuel prudently postponed all attempts to annex Rome and Venice; and directed his attention to the internal affairs of his kingdom, which was much distracted by the intrigues of the sovereigns whom he had supplanted. At length, in the quarrel between Prussia and Austria for supremacy in Germany, appeared his opportunity; and an offensive and defensive alliance with Prussia was followed by an Italian invasion of Venetia (June, 1866). The Italians were defeated in the bloody battle of Custozza; but the disasters which befell Austria in her simultaneous contest with Prussia, forced the Austrian empire ultimately to surrender Venetia. In Aug., 1870, after the outbreak of the war between France and Germany, the last detachment of the French garrison which had occupied Rome since 1849 was withdrawn; the imperial city, finally united to the kingdom, became the capital of Italy and the seat of Victor-Emmanuel's court. The last years of Victor-Emmanuel's life were uneventful. He died after a short illness, Jan. 9, 1878, and was succeeded by his son Humbert.

VICTORIA, although one of the youngest, and, in point of area, the smallest of the colonies of the Australasian group, is already the most important. In extent of commerce, indeed, it takes precedence of all British colonies—India alone excepted. The extreme modernness, so to say, of the Australian colonial picture is one of its most striking features, for it belongs emphatically to the present generation. Men who are still in middle life may recollect when the Port Phillip settlement—the name first given to Victoria—had no existence; and those are not yet very old who may remember when even the geographical outline of Australia was incomplete, and when the great harbor of Port Phillip, now the busy scene of the world's commerce, was undiscovered and unheard of.

Geographical Position and Extent.—Victoria comprises the s.e. corner of Australia, at that part where its territory projects furthest into cool southern latitudes. Wilson's promontory, to the s.e., the most southerly headland, just passes the 39° of s. lat.; while the most northern point, which is at the opposite or n.w. extreme, is in s. lat. 34°. The long. comprises 9°—between 141° and 156° e. of Greenwich. To the w. is the colony of South Australia, separated by the 141° of e. long.; to the n. is New South Wales, separated by the line of the Murray river eastward from 141° e. long. to its source, and thence by a straight line s.e. to cape Howe; and from cape Howe to South Australia, again, the colony is bounded on the s. by Bass's strait. The extreme length is e. and w., and is about 480 m., by an extreme width, n. and s., of 250 miles. But a remarkable indentation of both the n. and s. boundary opposite each other, about the middle of the colony, reduces the breadth between the head of the Port Philip inlet and the Murray to only 120 miles. The superficial area is 56,245,760 acres, or 87,884 sq. miles.

Physical Aspect.—Although Victoria may be called mountainous, as compared with the general flatness of Australia, it has much of the quiet and peculiar scenery characteristic of that division of the world. Vast naked plains are deviously traversed by broad and deep river-channels, which are mostly, however, mere chains of ponds, if not altogether dry, excepting in winter and spring, or after heavy showers. Overspread, in

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Yambuk
LAWRENCE I.
C. Bridgewater
Bridgewater B.
C. Nelson
Nelson Bay
LADY JULIA PERCY I.
Belfast
Port Fairy
Dennington
Warrnambool
Allansford
Mt. Emu
Cobden
Curdies
Pirron Yalloak
Birregurra
Colac
L. Colac
Barwon R.
Layard
HEYTESBURY
Campbell
POLWARTH
Lorne
C. Patton
Middleton
Cape Otway
Aire R.
Light Ho.
Curdies Inl.
Port Campbell
Princetown
Gellibrand R.
Pt. Flinders
Pt. Lonsdale
Pt. Nepean
Tootgarook
C. Schanck
West Hd.
Western Port
PHILLIP I.
C. Wollamai
From Adelaide, 520 Geog. Miles
King George Sound to Melbourne, 1,340 Geog. Miles
Liverpool to Melbourne, 12,700 Geog. Miles
Melbourne to Launceston, Tasmania
B
A
S
S
HARBINGER RKS.
NAVARIN RK.
KING I.

VICTORIA
British Miles
10 5 0 10 20 30 40 50
Railroads thus
SOUTH WALES
Narrandera
Jugong
Gunning
Yass
Goulburn
Wagga Wagga
Gundagai
Tarcutta
Tumut
L. Urana
Lake George (dry)
Queanbeyan
Braidwood
Tucumwall
Billabong Cr.
Jingelec
Kiandra
Bunyan
Cooma
MT. KOSIUSKO 7,176
Bucklen
Snowy R.
Bega
Panbulla
Eden
Twofold B.
Boyd Tn.
C. Green
C. Howe
Mallacoota Inlet
Lit. Rame Hd.
Wingan Inlet
Rame Hd.
C. Everard
Sydenham Inlet
Mulwala
Corowa
Wahgunyah
Barkly
Albury
Bundalong
Rutherglen
Christmas Tn.
Chiltern
Yackandandah
Beechworth
Stanley
Wangaratta
Springhurst
El Dorado
Tarrawingee
OVENS DISTRICT
MURRAY DISTRICT
BENAMBRA
BOGONG
DELATITE
WONANGATTA
DARGO
TAMBO
CROAJINGOLONG
TANJIL
EVELYN
BULN-BULN
GIPPSLAND
MT. PINNADAR 4,100
PILOT
FOREST HILL
BUFFALO MTS.
MT. HOTHAM
MT. SMITH
LA TROBE
Omeo
L. Omeo 3,100
AUSTRALIAN ALPS
BULLA BULLA MT.
Bendock
MT. BIRREGUN
MT. BALDHEAD
Dargo
Waterford
Murrindal
MT. TAYLOR
Tambo
Bruthen
Sarsfield
Bairnsdale
L. King
L. Tyers
Ninety Mile Beach
Entrance to Lakes
COAST HILL
MT. EVERARD
MT. SELWYN
Mansfield
MT. HOWILL
MT. TORBRECKE
MT. BUTLER 5,330
MT. KENT
MT. VALENTIA
MT. WELLINGTON 5,269
CASTLE HILL
MT. ST. LEONARD
MT. USEFUL 4,842
MT. ANGUS
BEN CRUACHAN 2,912
BAW BAW MT. 5,062
Walhalla
Stratford
Lucknow
L. Victoria
Sale
L. Wellington
Seacombe
Tanjil
Toongabbie
Thomson R.
La Trobe R.
Rosedale
Longford
Stradbroke
Traralgon
TOMS GAP 1,328
Merrimans Cr.
Giffard
New Bruthen
Woodside
MT. FATIGUE
Alberton
Welshpool
Tarraville
Palmerstone
Port Albert
Tarwin
Corner Basin
SNAKE I.
MT. HUNTER
RABBIT I.
NOTCH I.
C. Liptrap
MT. LA TROBE
MT. WILSON
C. Wellington
GLENNIE IS.
Waterloo B.
Wilson Promontory
HOGAN I.
RODONDO I. 1,180 FT.
MONCOEUR IS.
DEVIL TR.
CURTIS 1,060 FT.
SUGARLOAF
JUDGEMENT RK.
ERITH I.
KENT GROUP
DEAL I.
ENDEAVOUR RF.
SISTERS
BASS STRAIT
146 147 148 149 150
34 35 36 37 38 39
146 Greenwich

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cool and moist seasons, with brilliant verdure, the drought and heat of summer quickly convert the grass into a natural hay, which, in the scarcity of sustenance from its ceasing to grow in that condition, is eaten off to the very roots by the sheep and cattle, leaving the surface a bare and blackened mass. The "open forest" is another and very pleasing variety of scenery characteristic of Australia, and largely prevalent in Victoria. It distinguishes the gently undulating country of the better soils, whose surface is overspread by large trees, chiefly of the red gum (*eucalyptus*) and silver wattle (*acacia*). The trees being widely apart and of spare foliage, and the surface free from underwood, there is commonly a good growth of grass, the whole presenting a charming and park-like aspect, although felt to be somewhat tame and monotonous, especially under the great defect of most Australian landscapes, the general want of water. Mountain and forest prevail most in the e. division, where the Australian Alps of Gipps's land, the loftiest of Australian chains, culminate in peaks ranging from 1000 to 7,000 ft. above the sea. The w. district, on the other hand, is chiefly remarkable for its numerous isolated hills of volcanic origin, some of them with craters still perfect, which probably have not, in a geological sense, been very long at rest. To this extensive volcanic system Victoria owes the large proportion of its good arable land, as compared with the light sandstone and granite soils that prevail elsewhere in Australia. The chief rivers, besides the Murray and its branches (elsewhere treated of), are the Snowy river, the Tambo, the Mitchell, the Macallister; and the La Trobe—all of Gipps's land; the Yarra-Yarra, the Goulburn, the Loddon, the Wimmera, the Avoca, the Wannon, the Ovens, the Hopkins, and the Glenelg, of which rivers, however, several are not perennial streams. The Australian fauna is very remarkable; notably the kangaroo or pouched family, and the emu or great wingless bird. There are besides the *echidna* and *platypus*, of quite a different family, and even more singular in structure, especially the last, as indicated by its other name of *ornithorhynchus paradoxus*. The dingo, or native dog, is remarkable as a non-marsupial exception, on which account it has been regarded as an introduction by human agency. But several years ago Prof. McCoy of Melbourne met with its fossil remains associated with those of extinct animals, and in deposits that, although recent, geologically speaking, are in other respects so remote as to establish this animal's indigenous claim.

Climate.—This is on the whole healthful and agreeable, but subject to frequent and sudden change in condition and temperature. The average temperature of the year is between 57° and 59°, or about 9° above that of London, and 7° above that of New York. The common summer-heat is from 65° to 80°, with an occasional advance to 90° and even to from 100° to 108°, during hot winds and a dry season. The winter range is mostly from 45° to 60°. Ice occurs in the midwinter of July, but it rarely, except on elevated ground, survives the noonday sun. Every few years an unusually severe season will cover the higher levels, and even the country generally, with snow, to recall to the colonists the familiar scenes of ancestral homes. The cold of winter is keenly felt, and household fires are not uncommonly indulged in for even six months of the year, especially in the morning and evening.

Civil and Political Divisions.—Victoria is divided into four districts and 37 counties, the principal counties being Bourke, Talbot, and Grant. Prior to 1848 there were but three counties, the still existing Bourke, Grant, and Normanby, laid out in 1837, along with the sites of several chief towns, when the infant settlement, then but two years old, was officially taken charge of by the New South Wales government, within whose jurisdiction the territory was then comprised. One chief object of the counties was to distinguish by certain special regulations the more accessible and valuable of the colonial lands, leaving the remainder (the districts) to pastoral or squatting uses. But the subsequent discovery of the gold-fields in 1851 interfered with this arrangement, as the new condition created towns and markets indiscriminately in county and district. Squatting is still an important colonial vocation, second only to gold-mining, and still pursued over most of the colonial area. The electoral districts, in general, coincide (but not always) with county and municipal divisions. This is the case for the assembly, but for the council or upper house there is (since 1881) a division of the colony into fourteen districts. For the purpose of local self-government there were, in 1894, besides counties, 58 urban districts and 145 rural municipalities. The former are towns, boroughs, and cities; and the latter are called shires.

History.—The distinction of first settling Victoria is due to the Messrs. Henty of Launceston, Tasmania, who occupied the s.w. part at Portland bay with some flocks of sheep in 1834. But the settlement that mainly influenced the future was that of the following year upon the shores of Port Phillip. This enterprise also was from Launceston, first in May and June by a small party under Batman, which occupied Indented Head, on the w. side, 15 m. inside the harbor; and again in August following by another party sent forth by Fawkner, he himself having been detained a short while longer by sickness. This last party passed on to the head of Port Phillip, ascended the Yarra, and settled upon the site of the present capital, Melbourne. The story of the subsequent progress is marvelous even in an age of marvels as to colonies. When the gold mines were discovered, the settlement, after 16 years' existence, had a colonial population of 80,000, of whom nearly one-third were in the capital. Thenceforth for several years the advance has scarcely been paralleled. The imports, exports, and the public revenue

increased tenfold. In 1856 Melbourne had become a city of great wealth and commerce, containing 100,000 inhabitants, while the colony comprised above 400,000. Although the race has since been at a more leisurely speed, Melbourne has continued to advance, and in 1890 the pop. had increased to 445,220. See MELBOURNE. Some interior towns besides, are rising to importance, in particular Ballarat. Geelong, with 21,380 of population, finely situated on the western arm of Port Philip, was second only to Melbourne; but is now surpassed by Ballarat (with 42,547) and Sandhurst (with 36,630), the two principal gold-field towns of Victoria. The pop. of Victoria in 1890 was 1,131,247.

Victoria, while a part of New South Wales, was termed the Southern or Port Philip district of that colony. As early as 1840 an agitation for separation, and a government independent of that of New South Wales, began, and was ended successfully in 1851, when the new colony received the name it now bears. The title of lieut.governor was then given to the queen's representative in this colony as well as in others adjacent, the gov.general being in New South Wales. But the rising importance of Victoria led to this distinction being discontinued some years afterward. This importance indeed expedited, to these colonies, their concession of self-government, which was inaugurated in the years 1854–56, with very lively demonstrations on the part of the colonists, who have since shown no want of interest or earnestness in the charge of their own affairs. During this last brief term, although the progress, in point of population, owing to diminished immigration, has been unimportant, there has been a very marked advance in the improvement of the colony generally, and of the arts and industries and amenities of social and commercial life. At the great international exhibition of 1862, Victoria stood at the head of the entire colonial department; and in less than twenty years this enterprising colony held an international exhibition on a large scale in its own capital (1880–81), which was visited by over 1,000,000 people.

Population, Colonists.—The population of Victoria, in common with that of the other members of the group, is in the main English, in the wider sense of the word. According to the census of 1891, 97 per cent. of the population were British subjects by birth, and of these the majority were native-born. Next in numerical strength to the native Victorians were persons born in the British Isles or in the other Australian colonies. The total population in 1891 was 1,140,405, showing an annual increase of 3.22 per cent. since 1881. The discovery of the gold fields brought in a large number of Chinese, who in 1891, however, numbered only 9377. In that year there were only 565 aborigines in the colony. The various religious denominations of the United kingdom contribute somewhat ratably their quota to the colonial population. The census of 1891 gave the numbers in connection with the various denominations as follows: Episcopalians, 417,182; Presbyterians, 167,027; Methodists, 158,040; other Protestants, 94,608; Roman Catholics, 248,591; Jews, 6459; Buddhists, Confusians, etc., 6746. At the time of this census about 75 per cent. of the population were Protestants and 22 per cent. Roman Catholics. Mission work is actively carried on.

Natives.—By the census of 1891, the aborigines were found to number 565, consisting of 325 males and 240 females. The number when the settlement began is usually stated to have been 6000, although probably much larger, seeing that Tasmania, only one-fourth of the extent, and with a climate less genial to savage life, is supposed to have contained 5000. But that is a point about which we can now only conjecture. The native is fast dying out from the colonized area. The progress of colonization has been utter destruction to his prospects. Philanthropic and Christian efforts on his behalf have not been absolutely barren. Mission stations in Gipp's Land, conducted by the Church of England and the Presbyterian church, have diffused the influences of civilization and religion to a considerable proportion of the survivors. These missions are under the immediate supervision of Moravians, and aim a little at the culture and preservation of the race, not without some evidences of success.

Commerce.—The two staple articles of export from the colony are wool and gold. The exportation of the former in the year 1894 was valued at £5,151,153; of the latter, at £3,750,737, in both cases an increase as compared with the previous year. After the gold discoveries in 1851 there came an extraordinary commercial development. For that year the imports had been £1,056,437, and the exports, £1,422,909. In 1854 the amounts were respectively £17,659,051 and £11,775,204. But this sudden extension—at least as regarded imports—was not maintained, because it was due, in part, to a temporary extravagance, and partly because the colony has since then been successfully organizing its industry, so as to produce cheaply, and partly by the introduction of a heavy protective tariff. For 1895 the imports were £12,472,344; the exports, £14,547,732. In 1895 the shipping entries amounted to 2,181,539 tons; clearances, 2,167,147 tons, a large number of which were British. The annual production of gold in Victoria has greatly decreased since 1856. In that year the output was valued at about £12,000,000, while in 1895 it was only £2,960,344, but the latter figure was somewhat in excess of the figures for each of the four preceding years. Between 1851 and 1895 the amount of gold mined in the province is estimated at 60,186,321 ounces, valued at £240,745,248. Between 1891 and 1895 the value of the exports of wool fell from £7,165,092 to £5,151,153. Beside these staple articles Victoria exports grain, live-stock, and leather in considerable quantities. The imports consist largely of manufactured articles. The British Isles and the other Australian colonies have the largest share of the trade. There is a tariff of about 15% on imported goods.

The chief colonial vocations are squatting or pastoral pursuits, agriculture, and latterly, gold-mining. The first-mentioned was the earliest that rose to importance; but the last has rapidly outrivaled every other. Agriculture, at first dwarfed by the success and influence of squatting, and for a time impeded afresh by the social upturning during the first years of gold-mining, is now, however, rapidly extending, and is improving, socially as well as physically, the aspect of the country.

Squatting.—This colonial term has long since passed from its originally semi-savage and outcast associations, to represent in Australia a rural aristocracy. The squatter, using the country just as he found it, placed upon it his live-stock, which lived and throve on the natural herbage. This ready adaptation of the surface, with comparatively little of preliminary outlay, is the chief cause of Australia's rapid progress. At first, the pastoral "stations," or "runs," as they were then very appropriately called, were uninclosed areas, parceled out to a small number with a very bountiful hand, and at a nominal rent or occupation license-fee. Now, however, these areas have been much subdivided, and much has been done in inclosing the runs with stout fencing.

Agriculture.—Comparatively little was accomplished in this branch for 25 years, until 1860, when the government began to increase the facilities for acquiring and cultivating the public lands. In 1861 there were but 180,000 acres under the plow; in 1896 the extent of land under the principal crops was 2,864,000 acres. The dry climate of Southern Australia seems favorable to the quality of wheat; and the Victorian samples at the great exhibition of 1862 ranked among the very best. In 1895–6 about 30,700 acres were under vines.

The following table taken from the report of the U. S. consul at Melbourne dated December 14th, 1896, gives the acreage under wheat, the average yield in bushels, and the average number of bushels per acre between 1889 and 1897.

Year.	Area.	Yield.	Average.
	Acres.	Bushels.	Bushels.
1889-90	1,200,000	11,912,500	9.92
1890-91	1,209,000	14,250,000	11.78
1891-92	1,247,000	13,387,500	10.73
1892-93	1,375,000	16,471,000	11.98
1893-94	1,395,000	13,985,000	10.02
1894-95	1,457,000	13,766,500	9.44
1895-96	1,486,000	7,675,000	5.16
1896-97	1,493,000	6,904,000	4.62

From this it will appear that the annual production of wheat has decreased and that the production per acre has also decreased. One cause of the decrease was the lack of rain and where irrigation was resorted to, good crops were produced, even in the dry seasons. Among the other cereals raised in the country were barley, maize, oats, rye, peas and beans. Next to wheat the most important cereal is oats. In 1895–6 there were 2,880,045 bushels produced, not much more than half as much as in the previous year. The oat crops also have suffered from drought and it has been necessary in many cases to resort to irrigation. Barley also showed a large falling off, but the production of maize increased considerably over the yield of 1894–5.

Manufactures.—In 1895 there were in Victoria 2675 manufacturing establishments, employing 41,273 hands. The value of the lands, machinery, etc., was estimated at £12,896,800. The manufactures are almost exclusively for the home market. A branch of the royal mint was opened in 1872.

Gold-Mining.—This may now be termed one of the skilled labors of the colony; but it is not by any means, on an average, among the most remunerative. Of the two great branches of mining — viz. (1), the crushing of the auriferous rock for the washing out of the gold, and (2), the washing from the débris or "drifts" which nature has already pounded down—the latter, as a simpler process, was at first the most general, but lately the other has been increasingly followed.

Railways.—The system is more extensive and complete than in any of the other southern colonies. At the end of 1895 there were 3103 m. of railway open for traffic. The railways are government property.

Finances.—The public revenue is derived mainly from these sources—customs dues, railways, posts and telegraphs, and public works. The total revenue of Victoria for the year 1894–5 was £6,712,152. The chief items were — customs, £1,809,140; crown lands, £473,580; railways £2,583,442; post and telegraphs, £509,721. The revenue for the year ending June 30, 1884, was £5,934,240. The income is generally ample for all expenses. The outstanding public debt amounted in 1896 to £46,886,211, by far the largest proportion of which was incurred in the construction of railways, all of which now belong to the state. Taxation, according to the revenue accounts, amounts to about £2.6s per head.

Political Institutions.—The self-government conceded to Victoria and the adjacent colonies gives them a responsible system similar to England. The governor represents the sovereign, who appoints him; and he governs by ministries, who are of the crown's, that is, of the governor's nomination, but who must possess the confidence of parliament. There are two houses of legislation, both in Victoria being elective—the council or upper house by a high and special qualification; the assembly by manhood suffrage, without any qualification for members. Elections are by secret ballot. The term of the governorship is usually seven years. The present salary of the office in Victoria is £7,000 a year; and in the expensive times more immediately succeeding the gold discoveries, it was £15,000. The salary is paid wholly by the colony; but by a recent imperial act, the home government allows moderate pensions to retired governors, according to the term of service. In 1891 Victoria sent delegates to the Australian convention held at Sydney, to frame a federal constitution. See IMPERIAL FEDERATION.

Religion.—The divergence of the self-governed colonies from home example is perhaps most striking in two very important subjects—religion and education. In religion, as in politics, the tendencies are toward a complete equality, and therefore opposed to the privileges involved in church establishments. In this respect, change of scene, and equality and independence of condition, sensibly weaken the strength of tradition and usage as exhibited in the senior country. All religious bodies, therefore, stand alike before the civil power, none having any coercive jurisdiction except such as its own members voluntarily impose upon themselves, either by their own rules, or by a special act solicited from the colonial legislature. In Victoria, until 1875, there was a yearly donation of £50,000 from the public revenue to the support of religion. It was distributed ratably among the sects, Unitarians and Jews included, and was "scheduled"—i.e., not subject to yearly vote—under the constitution act. This system, introduced into Australia as a substitution for the preceding church of England supremacy, terminated in 1875. Lately, the public feeling had tended to a disapproval of the system of indiscriminate support to religion, and some of the smaller bodies had altogether rejected it. The state aid was therefore abolished in some of the colonies. In Victoria, the assembly had repeatedly passed an abolition act, which, however, the council negatived. Ultimately, a bill passed both houses, whereby the grant in aid to religion wholly ceased in 1875.

Education.—The energy displayed on this subject by the popular administrations of the self-governed colonies, and the tenacious persistence with which they encounter the problem of the education of the whole people, are among the best results presented to us by these young offshoots. Under the preliminary "imperial régime" of colonial public life, the comparatively neglected field as to education is taken up, and with creditable zeal, by the various clergy, who institute, of course, the denominational system. But essential difficulties stand in the way of the successful importation of a general education under this system. A national system, to compete with the previously established denominational, had been introduced into New South Wales and Victoria with the advent of the partially representative legislatures that for about twelve years preceded the present self-government. National and denominational, each conducted by a separate board of management, were alike aided by the state. The institution of a partially national system, and of a single board, was carried in the Victorian legislature in 1862. That system was in effect, that all state-assisted schools must be open to the children of all religious bodies, and that four hours daily of secular teaching be imparted to every pupil. This arrangement, on experiment, was unsuccessful. Schools still remained in connection with the several denominations; denominational school committees controlled the election of teachers, who were also permitted to impart religious instruction where desired. As a result, schools were unnecessarily multiplied in some localities, and the money of the state was wasted in their support. After various attempts to establish a system of state schools unconnected with any denomination—attempts which several of the religious bodies combined to defeat—the Victorian government at last succeeded in overcoming all difficulties, and a bill passed both houses of the legislature, which completely establishes a national, as opposed to a denominational system of education. Education is secular, and compulsory for children between the ages of six and thirteen years; but secondary education is wholly under the control of private persons or of proprietary bodies usually connected with a religious denomination. There are numerous technical schools under the management of the department of education, several schools of mines, art schools, and schools for workingmen. There are public libraries or mechanics' institutes in the principal towns, and the library at Melbourne is especially large and fine. The percentage of illiteracy is small. In 1891, 95¾ per cent. of the population of 15 years of age or more could read and write. The total number of state schools in Victoria was (1895), 1922, with an enrollment of 232,052; 867 private schools with 38,062 scholars; besides grammar schools, various colleges, and the Melbourne university. Victoria has a university at Melbourne with three affiliated colleges, viz., Trinity College (Church of England), Ormond College (Presbyterian), and Queen's College (Wesleyan). The Ballarat School of Mines is also connected with the university. The university was opened in 1855 and has a considerable endowment. It was chartered in 1859 and confers degrees in all departments of university education except divinity. In 1895 there were 693 students in attendance.

Remarks to Emigrants.—Intending emigrants should understand that Victoria is no longer a new and scantily peopled territory, with all the superabundant employment and means of subsistence that are readily found now-a-days on such a scene by help of the arts and implements of an advanced civilization. There are now in the colony the advantages of a settled society, having much of the amenities of home-life; but, on the other hand, the colonial vocations are tolerably filled up by the increasing population, so that the unsuitable or the inexperienced have hardly any better chance out there than at home. It is owing to considerations of this kind that the system of free or assisted emigration—a system still maintained to a limited extent by the colony—has been latterly conducted upon very strict principles; the object being, that persons unsuitable to the colony may, as far as possible, be prevented from going there. The system of granting free passages has, on the whole, been recently discouraged by the legislature and government of Victoria, where the influx of the home poor is dreaded. Both free and assisted emigration is for the present wholly suspended. Laborers, mechanics, and artisans used to obtain assisted passages by what are known as passage warrants, issued to residents in the colony, on making the following payments to the colonial government: For each male under 15 years of age, £4; between 15 and 40, £8; above 40, £9. for each female under 15, £3; between 15 and 40, £4; above 40, £5. The warrants available for nine months after issue, had to be forwarded to the emigration agent of the Victorian government. Steady-going workingmen, agricultural and farm laborers in particular, are in request, and are sure to do well. Self-reliance, steadiness, and good conduct are essential requisites to success in all the colonies; with these, no workingman of the special classes referred to can fail to better his position, and add to the comforts and happiness of life. There is special encouragement to female emigration. As a general rule in Victoria at present, wages and remuneration generally are one-third or one-fourth higher than in Great Britain; while the chief requirements of life are, one with another, at about the same price as they are there. House-rent is rather higher, while butcher-meat is cheaper, and other necessaries about equal. The climate is, as a whole, highly enjoyable, with its bright skies and sunshine; but to workingmen, six months of the year (from the middle of October to the middle of April) will be found somewhat oppressive for great physical toil—a consideration no doubt present to the working-classes of the colony in connection with their successful introduction of an eight hours' labor system.

VICTORIA, a co. in s. Texas, having Lavaca bay for its s.e. boundary; drained by the Guadeloupe river; 850 sq. m.; pop. '90, 8737, chiefly of American birth, with colored. Co. seat, Victoria.

VICTORIA, a co. in n. New Brunswick, having the St. John river for its w. boundary, separating it from Maine; and Moose mountain in the s.w.; 3490 sq. m.; pop. '91, 18,217. Co. seat, Grand Falls.

VICTORIA, a co. of e. Nova Scotia, on the island of Cape Breton, having the Atlantic ocean for its e. boundary; 1200 sq. m.; pop. '91, 14,432. Co. seat, Baddeck.

VICTORIA, a co. in n.w. Ontario, drained by large lakes; 1305 sq. m.; pop. '91, 37,204. Co. seat, Lindsay.

VICTORIA, city, capital of the province of British Columbia, Canada, and co. seat of the Victoria district; at the s.e. extremity of Vancouver island; on the strait of San Juan de Fuca, and the Esquimalt and Nanaimo railroad; 84 miles s.w. of Vancouver. It was originally a trading post of the Hudson bay company; was platted for a town in 1852, and incorporated as a city in 1862; and has since become the most important Canadian city on the Pacific. It has extensive and rapidly growing commercial interests. Esquimalt, 3 miles distant and practically a suburb, is the seat of a new British naval station, with fortifications, dock yard, arsenal, royal naval hospital, and naval cemetery. Victoria has several hospitals, central, high, and ward schools, Anglican college for women, St. Ann's convent, public library, electric lights, and about 15 churches. It has regular steamship communication with San Francisco, Alaska, New Westminster and other points on the n.w. coast. Pop. '91, 16,841.

VICTORIA, a genus of plants of the natural order *nymphæaceæ*, resembling the common water-lily, but most nearly allied to the genus *euryäle*, and distinguished from it particularly by the deciduous tips of the calyx, and the sterility of the innermost stamens. Only one species is yet known, *Victoria regia*. This is said to have been first observed by Hänke, about 1801, and afterward to have been seen by Bonpland, D'Orbigny, and others. It was first described in 1832 by Pöppig, who observed it in the river Amazon; and it has since been found by Schomburgk and others in many rivers of the n.e. of South America. Its leaves are orbicular, float upon the water, and attain a diameter of 5 to 6 ft.; have the margin turned up, and about two inches high; are of a purplish color on the under side, and there exhibit a sort of wicker-work of very prominent veins, furnished with prickles. The flowers rise among the leaves upon prickly stalks. They are more than a foot in diameter, white, internally rose-colored, and are very fragrant. The fruit is a capsule, almost globose, with a depression on the top, about half the size of a man's head, fleshy within, and divided into numerous cells, full of round farinaceous seeds, which are an agreeable article of food. The plant is therefore called *maïs del agua*, or water maize, in some parts of South America. To the cultivation of this plant, special hot-houses have been devoted in some places in the

United States and in Europe. It has been introduced into India from seeds produced in England. See illus., FLOWERS, vol. VI.

VICTORIA I., Queen of the United Kingdom of Great Britain and Ireland, daughter and only child of Edward, duke of Kent, 4th son of George III., was born at Kensington palace, May 24, 1819. Her mother, Victoria Mary Louisa, was 4th daughter of Francis, duke of Saxe-Coburg Saalfeld, sister of Leopold, the late king of the Belgians; and married first to the prince of Leiningen, deceased in 1814; on July 11, 1818, she married at Kew, the duke of Kent. The duke died Jan. 23, 1820, leaving his widow in charge of an infant daughter only eight months old, who had been baptized with the names of Alexandrina Victoria. The duchess of Kent fulfilled the important duties which devolved upon her with more than maternal solicitude, and with admirable care and prudence. The infant princess, as she grew up, was taught to seek health by exercise and temperance, to acquire fearlessness even from her amusements, such as riding and sailing, and to practice a wise economy united to a discriminating charity. After a few years the duchess of Northumberland was associated with her mother in her nurture and education. The princess Victoria became accomplished in music, drawing, and the continental languages; and acquired a knowledge of some of the sciences, particularly botany. Her father having belonged to the whigs, her political education was naturally derived from the members of that party; and to viscount Melbourne (q.v.) belongs the credit of having thoroughly instructed her in the principles of the British constitution. She ascended the throne of the United Kingdom on the demise of her uncle, William IV. (q.v.), June 20, 1837; her uncle, the duke of Cumberland becoming king of Hanover in virtue of the law which excludes females from that throne. By this event, the connection which had lasted for 123 years between the crowns of England and Hanover was terminated. Victoria was proclaimed, June 21, 1837, and crowned at Westminster, June 28, 1838. She found on her accession viscount Melbourne at the head of the government; and during his premiership and with the cordial assent of her subjects, the young queen was married at St. James's palace (Feb. 10, 1840) to prince Albert (q.v.), prince of Saxe-Coburg and Gotha, and second son of the then reigning duke. Her majesty has had issue—four sons and five daughters: the princess royal, Victoria, b. Nov. 21, 1840, married Jan. 25, 1858, to Frederick William, who in 1888 became Frederick III., emperor of Germany, of brief reign; Albert Edward, prince of Wales, heir-apparent to the throne of the United Kingdom, b. Nov. 9, 1841, married Mar. 10, 1863, princess Alexandra Caroline, eldest daughter of Christian IX., king of Denmark; princess Alice, b. April 25, 1843, married July 1, 1862, prince Frederick William of Hesse (d. 1878); prince Alfred, b. Aug. 6, 1844, created duke of Edinburgh, 1866, married Jan. 23, 1874, Marie, only daughter of the emperor of Russia; princess Helena, b. May 25, 1846, married in 1866 to prince Christian of Denmark; princess Louisa, b. Mar. 18, 1848, married in 1871 to the marquis of Lorne; prince Arthur, b. May 1, 1850, created duke of Connaught, 1874, married in 1879 princess Louise Marguerite of Prussia; prince Leopold, b. April 7, 1853, was created duke of Albany, 1881, and married to princess Helena of Waldeck in 1882 (d. 1884); princess Beatrice, b. April 14, 1857, married, 1885, prince Henry of Battenberg.

For the changes of administration in this reign, see the articles GREAT BRITAIN, MELBOURNE, PEEL, RUSSELL, DERBY, ABERDEEN, PALMERSTON, GLADSTONE, DISRAELI. The legislative measures of greatest importance were the establishment (1840) of the penny-postage (see POST-OFFICE); the amendment of the poor-laws (q.v.) in Scotland (1845) and Ireland (1847); the abolition (1846) of the corn laws (q.v.), and (1849) of the navigation laws (q.v.); the Irish encumbered estates act (see TITLE, etc.); the transfer (1858) of the Indian possessions from the East India company to the crown (see INDIA); the admission (1858) of Jews into the house of commons; the reform act of 1867; the disestablishment of the Irish church (1869); the Irish land acts ('70, '81); the abolition of purchase in the army (1871); the elementary education act for England (1870), and the Scotch education act (1872). See NATIONAL EDUCATION. Other events signalizing this period were the formation of the free church (q.v.) of Scotland (1843); the discovery of the northwest passage (see NORTHEAST AND NORTHWEST PASSAGES) by M'Clure (1850); the exhibitions (q.v.) of 1851 and 1862; the discovery of gold in Australia (q.v.) and in British Columbia; the war (1854–56) with Russia (q.v.) in defense of Turkey (q.v.), in which the siege of Sebastopol was the chief item; the Indian mutiny in 1857 (see INDIA); the volunteer (q.v.) movement (1859); the establishment (1866) of telegraphic communication with America (see TELEGRAPH); the Abyssinian war, 1867 (see ABYSSINIA); the formation of the dominion of Canada, 1867 (see CANADA); the Ashanti (q.v.) war (1873–74); the Afghan war (1878–80); and the Zulu war (1879). The same period has witnessed the most signal changes among surrounding nations; 1848 was a year of European revolutions, during which the only disturbance in Great Britain was an abortive chartist demonstration (see CHARTISM). The constitutional monarchy of France (q.v.) fell, and was succeeded by a republic, which soon gave place (1852) to the second empire under Louis Napoleon (q.v.), followed again by a republic in 1870. The great civil war in the United States of America (q.v.) has resulted in the extinction of slavery; the formation of the kingdom of Italy (q.v.) has been completed by the acquisition of Venetia and Rome; the unification of Germany, begun by the formation of the North German confederation, as the result of the war between Prussia and Austria in 1866, has been

consummated by the events of the Franco-Prussian war (1870–71); and the ever formidable "eastern question," raised again in 1876 by the insurrection in Herzegovina, led in 1877 to war between Russia and Turkey, and to sweeping changes in the Balkan peninsula (see TURKEY). For recent events of her reign, see GREAT BRITAIN ; EGYPT ; HOME RULE ; FENIAN, etc.

In 1876 "Empress of India" was added to the royal titles of Queen Victoria. The premature death of the prince-consort (see ALBERT) on Dec. 14, 1861, caused the queen to seclude herself for several years from public life. Queen Victoria has published three volumes—*The Early Days of His Royal Highness, the Prince Consort; Leaves from the Journal of our Life in the Highlands* (1869) ; and *More Leaves, etc.*, 1882.

"In Queen Victoria," according to Macaulay, "her subjects have found a wiser, gentler, happier Elizabeth." No former monarch has so thoroughly comprehended the great truth that the powers of the crown are held in trust for the people, and are the means, and not the end of government. This enlightened policy has entitled her to the glorious distinction of having been the most constitutional monarch England has ever seen. Not less important and beneficial has been the example set by her majesty and her late consort in the practice of every domestic virtue. Their stainless lives, their unobtrusive piety, and their careful education of the royal children have borne rich fruit in the stability of the throne, and have obtained for the royal family the admiration of the world. The 50th year or jubilee of the queen's reign was celebrated by imposing ceremonies at London, June 21, 1887, and the 60th in 1897. On the latter occasion deputies were present from all parts of the British colonies and from foreign countries. An imposing feature of the celebration was the naval review at Spithead, in which 170 ships were drawn up in five lines, nearly five miles in length.

The progress made by the nation in the various elements of civilization, especially in that of material prosperity, has been unparalleled (see GREAT BRITAIN); and perhaps during no reign has a greater measure of political contentment been enjoyed.

VICTORIA BRIDGE, across the St. Lawrence at Montreal, on the Grand Trunk railway of Canada. This, the greatest tubular bridge in the world, was begun in May, 1854 and finished in Dec., 1859. The engineers were Robert Stephenson and Alexander M. Ross. The dimensions and other particulars are stated in the article TUBULAR BRIDGE.

VICTORIA CROSS. See CROSS, VICTORIA.

VICTORIA FALLS. See ZAMBESI.

VICTORIA LAKE, called also ALEXANDRINA or KAYINGA LAKE, a brackish lagoon in the s.e. of South Australia, is separated from the sea only by a narrow belt. It receives the rivers Murray, Bremer, Angus, and Finnis, and communicates with the sea by a narrow passage that leads into Encounter bay. It is 30 m. long, and about 12 m. broad. A sandbar at the entrance to the lake impedes access for vessels from the sea; but the interior navigation is safe.

VICTORIA-N'YANZA. See N'YANZA.

VICUG'NA, *Auchenia vicugna*, a species of the same genus with the llama and alpaca. It is a more beautiful animal than any of its congeners. In size, it is intermediate between the llama and the alpaca. Its neck is longer and more slender than theirs; its wool is also finer, short and curled. It is of a rich brown color, with patches of white across the shoulders and the inner side of the legs. The vicugna inhabits the most desolate parts of the Cordillera, at great elevations; and delights in a kind of grass, the ychu (*stipa ychu*), which abounds there in moist places; but it seldom ventures to the rocky summits, for which its tender feet are ill adapted. It is commonly found in small herds of from 6 to 15 females with one male. When the females are quietly grazing, the male stands apart and carefully keeps guard, giving notice of danger by a kind of whistling sound and a quick movemen of foot. When the herd takes to flight, the male covers their retreat, often pausing to observe the motions of the enemy. If he is wounded or killed, the females gather round him, and will suffer themselves to be captured or killed rather than desert him. The vicugna is a very active animal, like the wild goat or the antelope. The Indians seldom kill it with fire-arms, but set up a circle of stakes, about a mile in circumference, into which the vicugnas are driven.

VIDA, MARCO GIROLAMO, abt. 1480–1566, b. Cremona, Italy; educated at Padua and Bologna, and became a canon of St. Mark at Mantua. In 1532 he was made bishop of Alba. Vida was a learned Latinist and profound scholar. Of his poems, the best, a treatise *De Arte Poetica* (1527); *Christias*; and *Scachiæ Ludus*; have been translated into English, the last by Goldsmith.

VIDAURRI, SANTIAGO, about 1803–67 ; b. Mexico, began life as a lawyer, served in several wars, attained the rank of gen. and became governor of Nuevo Leon, 1853, arbitrarily annexing the state of Coahuila. He assisted in the operations against Santa Anna 1854–55, in the "war of reform" 1857–60, and against French intervention, 1862–64; became cabinet minister of Maximilian; was taken prisoner at the capture of the city of Mexico, and shot as a traitor.

VIDETTE (Ital., *vedetta*, "a watch tower"), is a mounted sentry, stationed at the outposts of an army to watch an enemy and give the alarm in case of danger.

VIDOCQ, FRANÇOIS–JULES, who acquired notoriety as a detective-officer of police at Paris, was born, July 23, 1775, at Arras, where his father was a baker. On the principle

of set a thief to catch a thief his earlier life may be regarded as an almost invaluable apprenticeship to the profession in which he afterward became distinguished. As a boy, he was employed in his father's shop, the till of which, it was found, he persistently robbed. To cure him of this evil habit, he was sent to the house of correction; but so little were his morals improved there, that he signalized his return to business by decamping with a sum of about £80. Of this money, a sharper relieved him at Ostend, and in order to keep himself in life, he engaged himself to sweep the cages of a traveling menagerie. From this menial service he was advanced to the post of tumbler and acrobat; and a further promotion was intended him to that of a supposed savage, whose performance involved the eating of raw flesh, and drinking greedily of blood. As he saw fit to decline the appointment, his further services were dispensed with; and shortly after, he returned to his father. Having entered the army, he attained the rank of corporal, and served with some credit in Belgium and elsewhere, till a wound obliged him to return home. For some years after, he seems to have lived as a scoundrel at large, occupying himself in swindling and disreputable love-affairs. In 1796 he turned up in Paris, and being detected in forgery, he was sentenced to pass eight years as a galley-slave. Before his term of durance had expired, he found means to escape, and became one of a band of highwaymen. As the story goes, his new associates on chancing to discover that he was an escaped galley-slave, saw fit to decline his further acquaintance. This refinement of squeamishness on the part of these gentlemen of the road, seems not in itself very probable; but on whatever ground of dislike, they desired to rid themselves of M. Vidocq, and summarily did so, exacting from him a solemn oath not to betray them. M. Vidocq took the oath very solemnly, and instantly proceeded to deliver the whole gang into the hands of the authorities. This pretty exploit seems to have suggested to him the *rôle* which he afterward developed with such consummate success. Hieing to Paris, he offered his services to the authorities there as a spy upon the criminal classes. His advances were at first coolly received; but gradually he made his way; and shortly his services became so important that official recognition was vouchsafed him. In 1812, a "Brigade de Sûreté" was organized, with Vidocq as chief. Consisting at first of only 4 men, by degrees it was enlarged till it came to include 28; and its efficiency was something marvelous. Suspicions, however, grew rife that Vidocq was himself the originator of many of the burglaries he showed himself so clever in hunting out, and even contrived to make a good thing of them. It does not appear that this charge was in any case clearly brought home to him; but M. Vidocq being plainly the sort of person in whom any suggested blackguardism is rather more likely than not, it had every inherent probability. Guilty or not, as he may have been, so strong was the popular feeling against him that, in 1825, it led to his being superseded. After his dismissal, he became a paper manufacturer; and in 1834, established a Trade Protection society, the object of which was to furnish confidential information as to parties whose credit might be dubious. In 1829 he published an autobiography, a *rédaction* of which he put forth in 1844 (Eugène Sue's famous novel having just taken the public by storm), under the title of *Les Vrais Mystéres de Paris.* Finally, he died in Belgium in the year 1850.

VIÉLÉ, Egbert Ludovickus, b. Waterford, N. Y., 1825; graduated at West Point, 1847, served in the Mexican war, 1847–48, and in the Indian wars, 1848–52. He became a civil engineer, 1853; state engineer of New Jersey, 1854–56; chief engineer of Central Park, New York, 1856–60; and chief engineer of Prospect Park, Brooklyn, resigning to enter the union army as capt. of engineers, 7th N. Y. militia; became in 1861 brig.-gen. of volunteers; engaged in the expeditions to Port Royal, Fort Pulaski and Norfolk; was military governor of Norfolk 1862–63, resigned in 1863, and resumed his engineering practice in New York, becoming president of the department of parks, and member of congress 1884. He is a contributor to the transactions of the American geological and other societies, and published a *Hand Book for Active Service* (1861); *A Topographical Atlas of the City of New York* (1865), etc.

VIEN, Joseph Marie, 1716–1809, b. France; studied art at the academy, and after taking the grand prize in 1743 with his "Plague of the Israelites in the time of David," studied for six years at Rome. He became a member of the French academy in 1775, and director in 1781. His pictures are all of historical or mythical subjects, and he introduced a new style of painting. Among his best pictures are "Hector inciting Paris to arm for the Defense of Troy," "The Parting of Hector and Andromache," "Cupid and Psyche," "The Resurrection of Lazarus," and "The Sleeping Hermit."

VIEN'NA (Ger. *Wien*, Lat. *Vindobona*, afterward *Faviana*), capital of the Austrian empire, stands on a plain at the foot of the last hills of the *Wiener Wald*, which forms the eastern extremity of the Alps. East of it extends a vast plain, as far as the eye can see, away to the Carpathians, which are visible on a clear day in the distance. On the n. the hills approach within half a dozen m. of the city, and extend uninterruptedly, to the w., to the Tyrolese Alps. An arm of the Danube (called a canal) passes along the n.e. side of the city, and separates it from the suburb of Leopoldstadt. Into this arm flows the foul and (when not swollen by rains) insignificant stream, called the Wien, from which the city takes its name. Vienna consists of the old city or inner town, called the *Stadt*, with narrow and irregular streets, and of a circle of suburbs, eighteen in number, completely surrounding it. Around the *Stadt*, and separating it from the suburbs, is a ring space upon which were formerly the fortifications, leveled in 1858,

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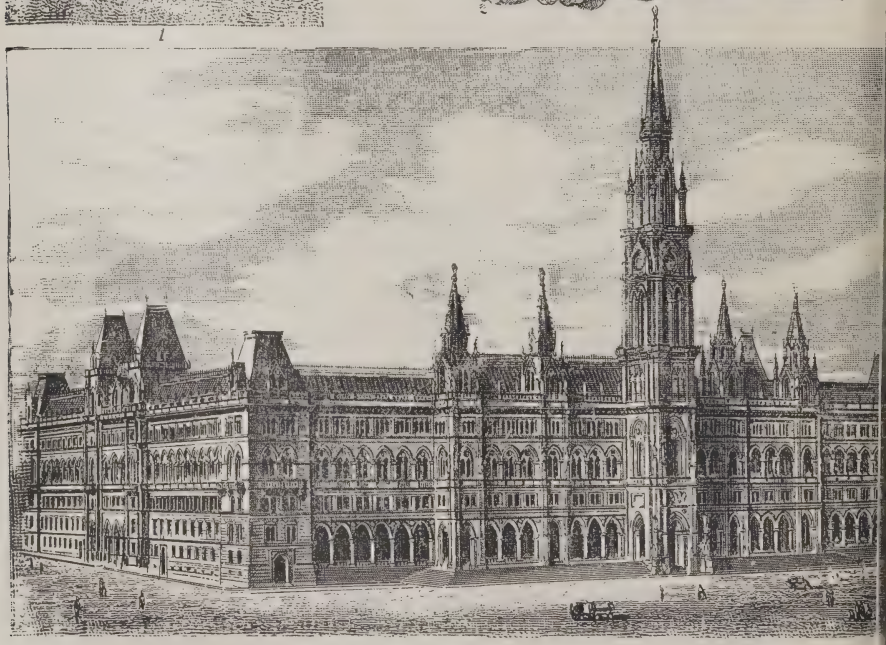
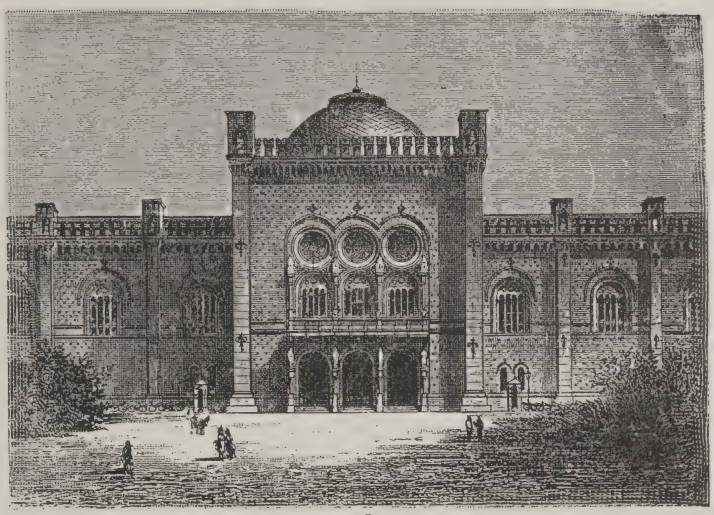


VIENNA, ETC.—1. Austrian general. 2. Passion play, Oberammergau. 3. Museum of
6. Waterspout from cathedral, Prague.



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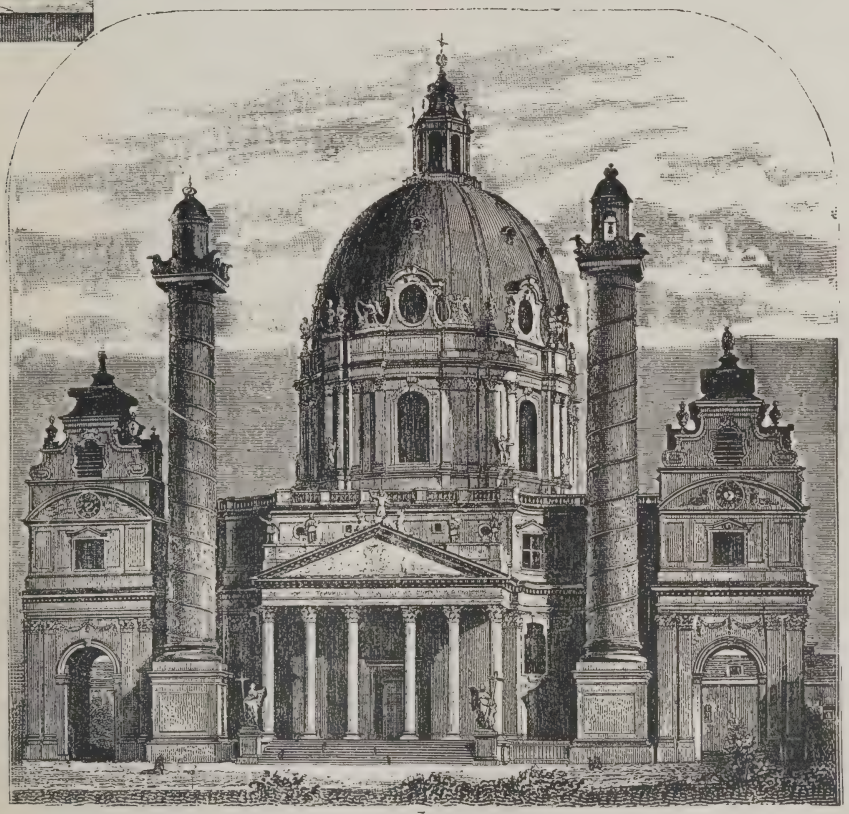

ns (Arsenal); 4. Municipal building; 5. Church of St. Charles Borromeo, all at Vienna.

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and which has been converted into a series of handsome boulevards 62 yards in breadth, known as the Ringstrasse, comprising the *Burgring*, *Opernring*, *Kärntherring*, etc., and architecturally one of the finest streets in Europe. Besides the internal fortifications just mentioned, there is an external ring with rampart and fosse, erected in 1704 as a protection against the Hungarians. These fortifications are called the *lines*, and at one time encircled both suburbs and city and were preserved as the boundary-line of the city imposts, until 1890, when the city limits were extended, to include nine additional districts, with a total circumference of 39 miles, in place of the former 23 m. Unlike most other European cities, the old part of the city is the most fashionable. In the *Stadt* are the palaces of the emperor and of some of the principal nobility, many stately mansions, the public offices, the finest churches, most of the museums and public collections, the colleges, the exchange, and the best shops. Since the erection of the Ringstrasse and other buildings upon the site of the old glacis, however, very many of the aristocracy have gone there to live. The suburbs are laid out in wide streets, many of which, being unpaved, are extremely dusty in summer, and very muddy in winter. As a rule, the houses are let in "flats," almost the only exception to this being the palaces of the higher nobility, and in some cases even these consist only of the two lower stories of the building. Among the principal squares are the *Josephsplatz* and the *Burghof* (the latter the court of the palace); the outer *Burgplatz*, which is laid out with grass and flowers, and in which stands the *Burgthor*, the *Neuer Markt am Hof*, and *Frieung*. The last three are in the heart of the city, contain many picturesque buildings, and are otherwise interesting, standing as they do in much the same relation to Vienna as the Grassmarket to Edinburgh. Vienna is the see of an archbishop; and the chief of its many churches is the cathedral of St. Stephen. This church is 354 ft. long, 229 ft. broad, and 80 ft. high, and has a very beautiful tower, 450 ft. high, erected in 1860–64, to replace the former structure, which was removed because of its unsafe condition. Its different parts have been built at many different periods, the choir having been commenced in 1359, while the nave dates a century later. The church of the Augustines is remarkable for its monument of the archduchess Christina of Saxe-Techen, one of the most successful works of Canova. The most beautiful church in Vienna, and one of the most beautiful in the whole of Germany, is the *Votiv-Kirche*, built in commemoration of the emperor's escape from assassination in 1853. It is a Gothic church not completely finished till 1878, with two towers and spires, and covered with delicate and beautiful tracery and carving. The imperial royal palace is an ancient building, consisting of various parts, erected at different times. Adjoining the palace, or forming part of it, are the extensive imperial library, the treasury, the cabinet of coins and antiquities, etc. Among the other collections of interest are the belvedere, including the Ambras collection (pictures, sculptures, and antiquities); the arsenal; the Liechtenstein gallery; count Harrach's collection (pictures); and the Albertina (drawings and engravings), the latter containing the original study of Raphael's "Transfiguration." The polytechnic institution (for instruction in practical science, etc.) is attended by about 1000 pupils, and in connection with it there is a capital technological museum. The university (founded 1365) had in 1893–4 upward of 6600 students on its roll (of whom upward of 3500 are in the faculty of medicine), a staff of over 400 professors and lecturers, and a library of 320,000 vols. As a school of medicine it is celebrated all over the continent. The principal places of public resort for the lower classes are the gardens of the palace at Schönbrunn, the *Augarten*, and the *Prater*, the latter being probably the largest park in Europe. Vienna contains two imperial theaters, the magnificent opera-house, and the *Hofburg Theatre*, and numerous private theaters, the *Deutsches Volkstheatre*, *Theatre an der Wien*, etc. The industries of Vienna are of great importance and include the manufacture of machines and locomotives, carriages, mathematical, optical, physical, and surgical instruments, pianos, fireproof safes, lamps, jewelry, gold and silverware, chemicals, perfumery, paints, varnishes, silk, woolen, and cotton fabrics, carpets, shawls, etc. Gloves, fancy leather goods, and meerschaum pipes figure among the specialties of Vienna. Very extensive works were begun in 1869, designed to bring the Danube closer to the city and improve its navigation. These were completed in 1880 at a cost of more than £2,000,000, and are expected to make V. the staple place of ship-trade between east and west, as it already is the main center of railway communication. The V. observatory was equipped in 1881 with the largest telescope hitherto made. Pop. of V. '96, 1,526,623.

VIENNA, TREATIES, ETC., OF. This capital, from its central position, and from the prominent part which Austria has always taken in the wars of modern Europe, has been oftener selected than any other city (Paris perhaps excepted) as the meeting-place of the representatives of the various European nations. The *first* treaty of Vienna (April 30, 1725) was a mutual guaranty of their dominions by the emperor Charles VI. and Philip V. of Spain; besides which, the former agreed to aid in the recovery of Gibraltar from Britain, and to aid the pretender in supplanting George I., in consideration of the latter guaranteeing the pragmatic sanction. The *second* treaty (Mar. 16, 1731) was a joint guaranty of the pragmatic sanction by George II. of Britain and the states of Holland. The *third* (Nov. 18, 1738) was a similar guaranty by Louis XV. of France in consideration of the reversion of Lorraine and Bar (to be given meantime to Stanislas, the ex-king of Poland), as well as a settlement of the Polish succession dispute, and a

re-arrangement of the possessions of Austria, Spain, and Sardinia, in Italy. The *fourth* treaty (Oct. 14, 1809) was concluded between France and Austria, after the battle of Wagram, and the armistice of Znaim, by which the latter agreed to resign some districts on the western border of the archduchy to Bavaria; Goritz, Friuli, Trieste, Carniola, and parts of Croatia, Carinthia, and Dalmatia, to France, these provinces to be formed into the government-general of Illyria; some districts of upper Lusatia to the king of Saxony; western Galicia, with Cracow and Zamocz, and a share in the salt mines of Wielicza, to the grand duchy of Warsaw; and the eastern corner of Galicia to Russia; a total loss to Austria of 58,170 sq.m., with a pop. of 3,500,000, and all her sea-ports.

The next, and by far the most important meeting of the representatives of European nations, was the *congress of Vienna*, which was held here after the first treaty of Paris, for the general settlement of the affairs of Europe. The congress, which first met on Sept. 30, 1814, was composed of the czar Alexander I., of Russia, with count Nesselrode; the king of Prussia, with Hardenberg; lord Castlereagh, and afterward the duke of Wellington, as representatives of Britain; prince Metternich for Austria; count Talleyrand for France; as well as representatives of Spain, Portugal, Sweden, Rome, Germany, and all the other minor powers, who were interested personally in the deliberations; the total number of those who assisted at the congress being about 500. But the representatives of the minor states, who had expected a species of European parliament, to which all would be admitted, were sadly disappointed by the preliminary resolution of the great powers to constitute two committees, one of which would deliberate on the affairs of Germany; and the other, composed only of the representatives of Austria, Prussia, Russia and Britain, would discuss the affairs of Europe generally, decide respecting the partition of the conquered districts (formerly belonging to France and her allies), and the frontier of each European sovereignty. To this latter council, Talleyrand, by the influence of Castlereagh, who early saw the necessity of a counterpoise to the influence of Russia and her follower, Prussia, in the conferences, was admitted (Oct. 5); and three days after, it was increased by the representatives of Spain, Sweden, and Portugal. The first resolution of the European committee, to rearrange Europe so as to leave the parties directly interested nothing more to do than give their adhesion to the arrangements made for them, being an arrogation of sovereignty over all Europe, was loudly exclaimed against; but the congress was one of rulers and *their* representatives, and not of the nations and *their* representatives, so the indignant clamor which rose on all sides was quite unheeded. The points which were at once and unanimously settled were—the constitution of Belgium and Holland into one kingdom (*the kingdom of the Netherlands*); the annexation of Norway to Sweden; the restoration of Hanover, with a large slice of Westphalia, to the king of Great Britain; of Lombardy to Austria; and of Savoy to Piedmont. But the question as to the disposal of Poland, Saxony, and Genoa, were not so easily settled. Russia and Prussia, overweeningly vain of the prominent share they had had in crushing Napoleon, were bent on aggrandizement of the most extravagant sort; the former loudly insisting on obtaining the whole of the grand duchy of Warsaw (see POLAND); while nothing less than the whole of Saxony, and some of the trans-Rhenish provinces of Westphalia would satisfy the latter; and both significantly hinted at the proximity of their colossal armies, with the view of awing the other powers into compliance. But Castlereagh was not the man to be so influenced; and while steadily refusing to yield an iota to such preposterous pretensions, he joined with Metternich and Talleyrand in a secret treaty, offensive and defensive, Feb. 3, 1815; which was cordially acceded to by Hanover, Sardinia, Holland, and Bavaria. The news of this agreement soon leaked out, and produced a considerable modification in the pretensions of the northern powers. At last it was agreed that Prussia should obtain a portion of Saxony (now Prussian Saxony), Posen, Cleves, Berg, the greater part of the left bank of the Rhine as far as the Saar, and Swedish Pomerania; and cede East Friesland, Hildesheim, etc., to Hanover, Anspach and Baireuth to Bavaria, and Lauenburg to Denmark; while with the exception of Posen, Thorn, and those parts of the grand duchy which had been (1809) taken from Austria, Poland was to be erected into a kingdom separate from Russia, but under the rule of the czar. Austria recovered the cessions which she was forced to make in 1809, obtaining also the Valteline from Switzerland, and the establishment of collateral Hapsburg lines in Tuscany and Piombino; while Maria Louisa obtained Parma. The pope was replaced in his former position as a temporal sovereign; the ancient constitution of Switzerland re-established; and Genoa—despite the strongly expressed aversion of its inhabitants—incorporated with Sardinia. The news of Napoleon's return from Elba somewhat hurried the conclusion of these multifarious arrangements, yet the negotiations were not interrupted; Metternich's scheme for a new confederation of the German states (the same which has continued till 1866) was unanimously agreed to, the question of mutual indemnities, rectifications of frontier, etc., being subsequently settled (July 20, 1819) at Frankfort, by a territorial commission composed of representatives of the four great powers. The questions of the slave trade and of the free navigation of the Rhine and its tributaries, were brought up by England, and also satisfactorily settled. Finally, a formal treaty (the *fifth treaty of Vienna*) was drawn up and signed, June 9, 1815.

VIENNA PASTE is a preparation which is extensively used as an encaustic, although it is not contained in the Pharmacopœia. A mixture, termed *potassa caustica cum calce*

(caustic potash with lime), which is itself a caustic, and is much employed for producing issues, is first prepared by mixing equal weights of caustic potash and freshly burned lime in a warm mortar, and rubbing them to a powder, which should at once be placed in an air-tight bottle. The caustic powder of which Vienna paste is made is obtained by similarly mixing 50 parts of the preceding compound with 60 of quick-lime. It must be kept in a well-stoppered bottle; and when required for use, the powder is made into a soft paste with a little spirit, and applied to the part it is desired to cauterize. It is much employed by some physicians in certain affections of the womb; and is one of the best applications to an indurated chancre. See SYPHILIS.

VIENNE, an interior dep. in the w. of France, bounded on the n. by the deps. Maine-et-Loire and Indre-et-Loire, and on the w. by Deux-Sèvres, which intervenes between this and the maritime dep. of Vendée. Area, 2691 sq. m.; pop. '96, 338,114. The Vienne, an affluent of the Loire, is the principal river, and all the other streams of the dep. are tributary to it. It flows from s. to n., and receives the Clain, with its tributary, the Gartempe, and the navigable Creuse. The surface is flat with a gradual slope toward the north. The country consists almost wholly of fertile plains, fine pasture-lands, and extensive forests. The climate is soft, temperate and healthy. Wheat, rye, barley, oats, and fruits are abundantly produced and the annual yield of wine is very large. The mineral riches of the department consist principally of iron and manganese, and numerous quarries of building and other stones, including lithographic stones, which are finer and harder than those of Munich. The dep. is divided into the five arrondissements of Poitiers, Châtelherault, Civray, Loudun, Montmorillon. Poitiers is the capital.

VIENNE, one of the most ancient t. of France, in the dep. of Isère, on the left bank of the Rhône, 19 m. s. of Lyons by railway. The river Gère passes through the town, and here joins the Rhône, after having supplied motive-power to a number of mills and factories. Vienne was the chief town of the Allobroges, is mentioned by Cæsar (*De Bello Gallico*, vii. 9), and by Martial, who terms it *opulenta Vienna*. At the time of the Roman emperors, it was a rival of Lyons. Besides numerous water-conduits, etc., of Roman construction, there is a temple supposed to have been dedicated to Augustus, and which is now used as a museum, and contains a number of ancient Roman remains. There are also a Roman arch, remains of a theater, and an antique pyramid, called L'Aiguille, 52 ft. high; and the cathedral of St. Maurice, a stately Gothic edifice, with much delicate carving. Manufactures of silks and woolens are carried on; and there is a good trade in wine. Pop. '91, 24,817. In 1312 a council was held here, in which Pope Clement V. pronounced the suppression of the order of the Templars.

VIENNE, HAUTE, an interior dep. of France, bounded on the w. by the deps. of Vienne, Charente, and Dordogne; area, 2130 sq. m.; pop. '96, 375,724. It is watered by the Vienne and its tributaries—the chief of which is the Gartempe. The surface is for the most part level; but traversed by ranges of low hills, of which the Monts du Limousin, which traverse the s. of the dep. from e. to w., rise in their highest summit to 3000 feet. The Mont de Puy-Vieux, the highest in the dep., is 3200 ft. above sea-level. The climate is cold, humid, and changeable. The soil is stony, and agriculture is in a very backward condition. There are, however, extensive meadows, and the domestic animals are reared in great numbers. Mines of iron, lead, copper, and antimony are worked, and there are quarries of granite and other building-stone, and in the south, near St.-Yrieix, valuable deposits of kaolin. The dep. is divided into four arrondissements—Limoges, Bellac, Rochechouart, and St.-Yrieix; capital, Limoges.

VIER'SEN, a prosperous and beautiful manufacturing t. of Rhenish Prussia, 18 m. w. of Düsseldorf. Viersen has extensive manufactures of flax and hemp rope, as also of woolen, damask, silk and velvet stuffs, and ribbons; there are also dye-works and manufactories of knitting machines. The population of Viersen has more than doubled itself within the last few years, being in '90, 22,198.

VIERZON-VILLE, a t. of France, situated on the Cher and the Canal du Berry, in the dep. of Cher, 49 m. s. of Orleans. Vierzon-Ville has blast furnaces, forges, and steel-refineries, manufactures of porcelain and earthenware, and a trade in cereals and wine. Pop. '91, 10,559.

VIETA (otherwise given VIET, VIETTE, or DE VIETTE, and by himself Latinized into VIETÆUS), FRANÇOIS, 1540–1603, the most eminent French mathematician of the 16th c., was b. at Fontenai-le-Comte, near La Rochelle. Of his early life and education we know nothing, and almost all our acquaintance with the meagre details of his personal history is derived from the records of his friend, De Thou (see THOU). Vieta was employed throughout his whole life in the service of the state under Henry III. and Henry IV., and devoted only his hours of leisure to the study of mathematics and other subjects—affording an excellent illustrative argument against the belief that abundant leisure is essential to high eminence, and in favor of the contradictory theory that mental work of whatever sort tends to prepare the mind for any other species of thought-labor. Vieta was a zealous Roman Catholic, and a strenuous supporter of the doctrine of the divine right of kings. His genius and persevering industry brought him prominently into notice on various occasions. During the war against the Spaniards, the latter, to preserve as much as possible their communications with their numerous

outlying possessions, and prevent the French from profiting by information from intercepted letters, adopted a species of cipher (see CRYPTOGRAPHY) of more than 500 characters, each varying from time to time in its signification. Some specimens being intercepted, were submitted to Vieta, who after a time discovered a key to the cipher, to the great discomfiture of the Spaniards, who, incapable of accounting for the discovery otherwise, attributed it to magic; though the story that Vieta was summoned to Rome to defend himself before the pope against the charge of having dealings with the devil may safely be regarded as untrue. Vieta's next prominent appearance was an as assailant of the Gregorian calendar, in opposition to which he published (1600) a "true Gregorian calendar," which was with justice considered by his contemporaries as inferior to that which obtained the papal sanction. However, Vieta did not, or would not, see his error, and attacked the Jesuit Clavius, to whom the pope had intrusted the compilation of the calendar, in a bitterly abusive manner; displaying, however, such a mastery of knowledge, that one of Clavius's defenders was led to sympathize with the unfortunate Jesuit who had to withstand the assault of one who was at once a lawyer, theologian, mathematician, orator, and poet. Vieta, however, is almost exclusively recognized by posterity as a mathematician; yet, though worthy to rank among the highest of this class, immediately after such men as Newton and Lagrange, the incessant state of politico-religious turmoil in which France was kept during his life, and the fact that all his works printed during his life were set up at his own expense, and distributed among his friends, have hitherto hindered a general recognition of his high merit. The Italian tabulators of the progress of mathematical science have thus had a good opportunity of decking out their national idols (Cardan, especially) with plumes stolen from the obscure French investigator. The claims of Vieta, however, are now becoming more and more generally recognized. He is indisputably entitled to be considered as the creator of modern algebra, which he established on the footing of a purely symbolical science; he applied his algebra to the extension of trigonometry, discovered the relations of multiple angles; and he extended the ancient process of extracting square and cube roots to the solution of all equations, an extension which has been since modernized and modified, and now appears as *Horner's method.* Besides, he proved his superior mathematical powers, by solving problems which had puzzled Apollonius, Regiomontanus, etc.; and was acknowledged by the mathematicians of Belgium and Italy as their master. Yet, strange to say, his own countrymen, the French, have so little knowledge of the surpassing talents and achievements of Vieta, that, omitting all intelligent mention of his peculiar successes, they ascribe to him praises due to his Italian predecessors, and to his great English successor, Newton. Most of Vieta's works were collected by Schooten, and published by the Elzevirs, at Leyden, in 1646. Two other works of his have been recently discovered, the *Harmonicon Cœleste* and the *Canon Mathematicus*, the latter the first table in which the trigonometrical functions of an angle are completely given. Of the first, two MSS. exist; while the second was printed and circulated according to Vieta's usual fashion, and has long been a bibliographical curiosity; but neither has yet been published. See Knight's *Eng. Cyc.* art. "Vieta."

VIEUXTEMPS, HENRI, b. Belgium, 1820; displayed proficiency on the violin when but a child, and was a pupil of De Bériot and Reicha. In 1830 he appeared at Paris and Vienna in public concerts, with great success, and was always marked by the public as one of the masters of his instrument. He visited America in 1843, 1855, and 1870, appearing on the last occasion in concerts with Mlle. Nilsson. He d. 1881.

VIEYRA, ANTONIO, 1608–97; b. Lisbon: entered the Franciscan order, and became the foremost preacher in his country. He went on diplomatic missions to various foreign courts, and in his last days was a missionary to Brazil.

VIGFUSSON, GUDBRAND, author and editor, b. in west Iceland, March 13, 1827, was descended from ancient Icelandic or Norse families. At twenty years of age he entered the University of Copenhagen, Denmark. His first literary essay was *Timatal, an Essay on the Chronology of the Icelandic Sagas* (old northern European popular historical or religious tales) in Icelandic (1854–55). It was followed by kindred productions, including collections of Sagas in Danish and Icelandic. In 1864 Mr. Vigfusson visited England, and was engaged in work upon a great Icelandic dictionary. Subsequently he edited other sagas (in England), and conjointly with Mr. York Powell (1879) an *Icelandic Reader*, etc., etc. In 1871 he was made an honorary M.A. of the University of Oxford, England, and in 1884 became professor of Icelandic language and literature there. He d. in 1889.

VIGIL (Lat. *vigilia*, Fr. *vigilo*, I watch), a preparatory time of devotion, which, by very ancient Christian usage, went before the more solemn festivals, and especially Christmas, Easter, Pentecost, and the principal martyrs' days. In English, it was called "eve" or "even," a name which is still retained in relation to several festivals, as Christmas eve, Hallow-e'en, etc. The observance is traceable in the very earliest centuries, and was established everywhere in the 4th and 5th centuries. It is one of the usages of his time against which Vigilantius inveighs, and which Jerome vindicates in his celebrated *Letter against Vigilantius.* On the day before the great festivals, which seems from the first to have been held as a fasting-day, the people assembled in great multitudes. The services proper to the vigil, but having a certain bearing on the coming festival, were celebrated; the night was spent chiefly in the church and in prayer, and other devotional

exercises; but abuses arose out of these night-watches, which led to their suppression, as well as to the abolition of certain festivities which grew up in connection either with the vigil or with the feast itself. The observance of vigils is still retained in the Roman Catholic church, and with it all the ecclesiastical offices, together with the fast, at least in the great vigils of Christmas, Easter, Pentecost, Saints Peter and Paul, Assumption, All-Saints, etc.; but all the other details of the celebration have gone into disuse. In the English prayer-book, the "vigils or evens" of the chief festivals of our Lord, of the blessed Virgin Mary, and of the Apostles are retained in the calendar; but they have no special services appointed for them, nor any other celebration. See Blunt's *Annotated Common Prayer*, p. 28.

VIGIL'IUS, b. in Rome, was, while a deacon, nuncio at Constantinople during the pontificate of Sylverias. Theodora, wife of Justinian, determined to depose Sylverias, and sent Vigilius to Rome to procure his imprisonment and exile. Vigilius was, at Theodora's suggestion, elected pope, 537. In 547 he was summoned to Constantinople by Justinian to sustain him against the western bishops in his condemnation of the "three chapters," i.e. of the writings of Theodore of Mopsuestia, Ibas of Edessa, and Theodoret. Vigilius considering the writings orthodox, refused to condemn them, and was banished to the island of Proconnesus, from which he was recalled, 554. He died on his way to Rome in 555.

VIGNETTE' (Fr. little vine, a tendril; Lat. *viticula*), a term originally applied to the flourishes in the form of vine tendrils, branches, and leaves with which the capitals in ancient manuscripts were often surrounded. Similar decorations were introduced into printed books, and all kinds of printers' ornaments, such as head and tail pieces, came to be designated as vignettes. More recently, the name has been applied to any small engraving (as on the title-page of a book). design, or even photograph, which is not circumscribed by a definite border.

VIGNOLA, GIACOMO BAROZZIO DA, 1507–73, b. Modena; studied painting at Bologna and architecture at Rome, and under Primaticcio in France. He returned to Bologna, and was chosen as the architect of several palaces and public buildings. In 1550 he was made papal architect by pope Julius III., and the latter part of his life was spent in Rome, where he designed the Caparola palace and the church of the Jesuits. He became the architect of St. Peter's after the death of Michael Angelo, and designed the two lateral cupolas. The designs for the restoration of the Spanish Escurial were his work. He was the author of *The Five Orders of Architecture* and *Practical Perspective*, still standard works.

VIGNY, ALFRED COMTE DE, a French poet and novelist, was born at Loches in Touraine, March 27, 1799, and educated at Paris. After spending some time as a soldier, he married, in 1826, a wealthy Englishwoman; and two years later, withdrew from the army, in order to devote himself exclusively to literature. He died Sept. 18, 1863. Vigny belongs to the romantic school, but is free from all their extravagance of style and sentiment. No modern French poet exhibits an equal refinement and delicacy. His principal works are *Poèmes* (1822); *Poèmes Antiques et Modernes* (1824–26), among which are his famous *Moïse, Dolorida*, and *Elva; Cinq-Mars* (1826), a historical romance of the time of Louis XIII., which is much admired in France, and has gone through more than a dozen editions; *Stello ou les Diables* (1832); *Servitude* and *Grandeurs Militaires* (1835)—two very striking and suggestive novels; *La Maréchale d'Ancre*, and *Chatterton* (1835)—dramas of considerable merit. Beside these, he published *Consultations du Docteur Noir* (1856). A posthumous work appeared in 1864, entitled *Les Destinées, Poésies Philosophiques.* See life by Dorison (Paris, 1892).

VIGO, a co. in w. Indiana, having the Wabash river and the state line of Illinois for its w. boundary; 410 sq. m.; pop. '90, 50,195, chiefly of American birth, with colored. Co. seat, Terre Haute.

VI'GO, an ancient town and seaport on the n.w. coast of Spain, in the province of Pontevedra, beautifully situated on a bay of the same name, about 85 m. n. of Oporto. Its delicious climate renders it important as a medical station; and its position on the slopes of a hill, oriental in its wealth of palms and orange-groves, is likely to tell in its favor as a residence for the rich. Its old walls and gates; its winding, narrow streets; its houses, white-washed, or colored red or green; the craft which frequent its harbor, and the picturesque dresses of the peasants, are delightful to the artist, as well as to the ordinary observer. Vigo has three churches, two convents and a theater. The country in the vicinity is exceedingly rich, and fruits, corn, wine, and oil abound. It exports considerable quantities of wines, preserves, sardines, and mineral waters. Pop. '87, 15,044.

The bay of Vigo has an inland sweep of 20 m., and is 5 m. wide at its mouth. The town has frequently been attacked by the English; by Drake in 1585 and 1589; by the duke of Ormond, Rooke, and Stanhope in 1702; and in 1719 by lord Cobham.

VIHÂRA (Sanskrit, meaning "walking for pleasure or amusement") is, with the Buddhists (see BUDDHISM), the name of their temples and convents. Originally it designated the hall or halls where the Buddha Sâkyamuni, and the priests by whom he was accompanied, used to meet; but when these halls gradually were converted into temples, the

name of *vihâra* was applied to them; and when, in time, the temples became the center of a number of habitations in which the priests belonging to the temples resided, the whole monastic establishment was comprised under the same name. Properly, therefore, the Vihâra merely designates the Buddhistic temple, and it is generally used in this restricted sense. Such vihâras are in Ceylon permanent structures, the walls being plastered, and the roof covered with tiles, even when the dwellings of the priests are mean and temporary. Near the entrance are frequently seen figures in relievo, representing the guardian deity of the temple. Surrounding the sanctum there is usually a narrow room, in which are images and paintings; and opposite the door of entrance there is another door, protected by a screen; and when this is withdrawn, an image of Buddha is seen, which occupies nearly the whole of the apartment, with a table or altar before it, upon which flowers are placed. The walls of the vihâra are covered with paintings, and its stories generally illustrate some legend of Buddha's life. Some vihâras are built upon rocks; others, and among these the most celebrated, are caves, in part natural, with excavations carried further into the rock. The cave-temple at Dambulla is one or the most perfect vihâras in Ceylon (see the description of it by Forbes in the *Ceylon Almanac* (1834). On the continent of India, the finest specimens are those at Ajunta, Ellora, Salsette, and Junir. Sometimes no land is attached to the vihâras, but sometimes also they are rich in land; and in the case of one of the vihâras in Kandy, there is an area belonging to it, which, under the native government, was regarded as a sanctuary for malefactors. See R. Spence Hardy, *Eastern Monachism.*

VIKING (plural Vikingr), a name given to the piratical Northmen who infested the coasts of the British islands and of France in the 8th, 9th, and 10th centuries. This word is quite unconnected with "king," being derived from the Scandinavian *vik*, a bay; and this class of marauders were so called because their ships put off, not like the king's ships, from the lawful harbor, but from the bay. See Normans.

VILAS, William F., b. Chelsea, Vt., 1840; graduated at the Wisconsin state univ., 1858; and at the Albany law school, 1860. He began the practice of law, and became one of the law lecturers at the state univ. In 1884 he presided over the national dem. convention; in 1885–88 was postmaster-gen.; in 1888–9, secretary of the interior; and in 1891–97 was U. S. senator.

VILAYET, the name given to the provinces of Turkey. Each vilayet is governed by a gov.-gen. and council, and is subdivided into sanjaks or liv'as, and again into cazas.

VILLA, a term now applied to detached suburban residences with about one acre or less ground attached to them. In the time of the Romans, the villa was a cluster of buildings in the country, forming a sort of private town, and containing in one the residences of the proprietor, farmer, and servants, and all the necessary offices and other accommodation for the cattle—the gardens, pleasure-grounds, etc. These villas were sometimes of enormous size, but they do not seem to have been built on any regular architectural plan, so as to produce an effect commensurate with their extent. The villa was divided into several parts, according to their uses: 1. The *villa urbana* was the portion in which the proprietor resided, and was laid out, as the name indicates, in a manner very similar to that of a town-house. The size and style of this part depends, of course, on the pleasure or quality of the master. It contained the eating-rooms, bedchambers, baths, covered porticos, walks, and terraces. 2. The *villa rustica* was the portion set apart for the stabling, servants, etc., and the accommodation for the cattle. Its extent depended on the size of the farm and number of cattle. 3. The *villa fructuaria* was for the wine, oil, and other produce. The number of servants accommodated in a villa was very great. The livery-servants, along with the gardeners for the pleasure-grounds, comedians, musicians, etc., belonged to the villa urbana. The *villicus* presided over the others, including the servants for tilling the land, the herdsmen, shepherds, goatherds, swineherds, poulterers, etc. There were also frequently several artisans, kept constantly on the premises, such as smiths, carpenters, etc.

VILLAFRANCA DI VERONA, a small t. of northern Italy, in the province of Verona, and 9 m. s.w. of the city of that name, on the left bank of the Tione, a tributary of the Tartaro. It is notable chiefly as the place where the treaty of peace between the emperors of France and Austria, which brought the Italian war of 1859 to a close, was signed July 11 of that year. Pop. commune, 8693.

VILLAFRANCA DEL PANADÉS (of the bakers), a t. of Spain, in the province of Barcelona, in Catalonia, 25 m. w. of Barcelona. It is the chief town of the rich wine district, El Panadés, which extends into the province of Tarragona. Pop. '87, 8344.

VILLANELLA (Italian), a rustic dance accompanied with singing. The melody was usually gay and the rhythm well marked. When words were used they resembled epigrams. The villanella ultimately became unaccompanied, part songs sharing the characteristics of the canzonetta and the balletta. The villanella of the Neapolitan school of the 17th century are among its most charming light productions. The best example of a modern villanella is Sir Julius Benedict's *Blest be the Home.* The Italian villanella and villotte, a rustic composition in counterpoint and the Spanish villancico, a species of song in two or more stanzas belonging to the 15th century, were the precursors of the madrigal.

VILLA'NI, Giovanni, 1280–1348; b. Florence; visited many parts of Europe; became celebrated as a historian and diplomat, and considered an authority on the Tuscan language. He belonged to the Guelph party, and filled many offices in the people's gift. He died of the plague. A chronicle of Florence (*Istorie Fiorentino*), in 12 books, was published in 1562–87, the 13th vol. being added by his brother Matteo, whose son Filippo continued it to 1365. It appeared in 7 vols. (1802), with a eulogy of Villani by Massai.

VILLA-REAL, a t. of Valencia, Spain, in the province of Castellon, and 5 m. s. of the city of that name, about 3 m. distant from the Mediterranean shore. It has wide, straight streets, laid out at right angles to one another, and contains flour and oil mills, woolen factories, and brandy distilleries. Pop. 12,887.

VIL'LARI, Pasquale, b. Naples, 1827. When in the university he became involved in the revolutionary movement of 1848–49, and was forced to leave the country. He resided at Florence for some years, and there published his *Life of Savonarola* (1859–61), which has been translated into many languages, and *Niccolo Machiavelli* (1877–82; new ed. 3 vols., 1895). He was afterward professor of modern history at Pisa and at Florence; general secretary of public instruction; deputy and senator in parliament; minister of public instruction, etc. He published many papers on education and of a critical nature.

VILLA RICA, a c. of Brazil, capital of the province of Minas Geraes, called also Ouro Preto (q. v.).

VILLARS, Charles-Louis-Hector, Duc de, Marshal of France, one of the most illustrious of the great captains of Louis XIV.'s time, was born at Moulins, in the department of Allier, May 8, 1653. Being of a noble family, his education, with a view to the military profession, was prosecuted at the college of Juilly, and he subsequently volunteered into the army which was employed in Holland; and having attracted Louis XIV.'s attention by his daring courage and striking elegance of figure, obtained a troop of horse in 1672, served for two years under Turenne in Germany, and after the battle of Seneffe received a regiment of cavalry, when yet in his 21st year. After a further term of service under Luxembourg and Crequi, he returned to Paris with the reputation of being one of the most promising young officers of the time. During the next ten years (1678–88) he was employed in diplomatic service, chiefly at the court of Bavaria. In 1688 Louvois appointed him commissary-gen. of cavalry; and, in the war which immediately followed the league of Augsburg, placed him at the head of the cavalry in Flanders. He was subsequently distinguished in the campaigns on the Rhine and in Italy. From 1699 till 1701 he represented France at the court of Vienna, and watched with sleepless vigilance the tortuous policy of the Austrian ministers, foiling by his penetration their most promising schemes, till he came to be regarded personally with extreme dislike, was shunned by all the court (prince Eugene excepted), and even his life threatened. On his return, he was employed in Italy under Villeroi; and, after a brief period of service under Catinat, was for the first time (1702) raised to independent command, when he was sent to succor the elector of Bavaria, who had taken up arms on the side of France. Toward the close of 1702 Villars crossed the Rhine, defeated the markgraf of Baden at Friedlingen, took Treves, Traerbach, and Nancy; and early in the following year, again crossed the Rhine, traversed the almost impassable defiles of the Black Forest, and, debouching from the mountains at Villingen, joined the elector near Dutlingen, on May 12. His bold and well-conceived scheme for carrying the war into the enemy's country by advancing upon Vienna, while so many Austrian troops were employed on the middle Rhine, in Italy, and against Ragotski in Hungary, was foiled by the stupid obstinacy of his colleague, the elector; and after his skill and genius had been tasked to the utmost to keep the Austro-Germans under the markgraf of Baden and Stirum at bay, and he had been relieved by the return of his ally (who had been soundly beaten by the Tyrolese mountaineers), he reopened his line of communication westward, and, leaving Marsin in command, returned in disgust to France. He was next commissioned to put down the insurrection of the Camisards (q.v.), which had been zealously fostered, for strategic reasons, by English and Dutch agents. Villars's manly moderation and soldierly frankless fairly won over Cavalier, the ablest of the insurgent leaders; and might, with his consummate military skill, have suppressed the insurrection. However, he was not allowed to manage matters for himself, and all he could do was to reduce the ferment to insignificant proportions. Villars was then sent to watch over the north-eastern frontier, and took post on the heights of Fronsberg, when Marlborough advanced upon him with 110,000 men; but Villars had shown such skill and strategy in the selection and fortification of his position, and such wise self-control in remaining strictly on the defensive, that the great English hero declined to risk an attack, and retreated; upon which Villars burst into Alsace, captured the enemies' reserves of supplies and artillery, and advanced to Rastadt and Stuttgart. The withdrawal of some of his troops to re-enforce the north French army forced him to recross the Rhine; yet, with his small army, he, in 1708, completely foiled all the attempts of prince Eugene to penetrate into France. In 1709 he was sent to oppose Marlborough in the north; but unfortunately, at the commencement of the battle of Malplaquet (q.v.), he was severely wounded, carried off the field insensible, and rendered unfit for service till the following year; and the reopening of his wound in the autumn of 1710 forced him again to resign the command. But in 1711 he returned to his post, headed the last

army France could raise, and with it fell upon the British and Dutch under Albermarle, who were intrenched at Denain (July 24, 1712), carried their intrenchments sword in hand, and captured the most of them; he then turned upon prince Eugene, and drove him under the walls of Brussels. This magnificent series of successes saved the national honor, and even life, of France, and brought about the peace of Rastadt (see UTRECHT), which Villars signed as plenipotentiary, May 6, 1714. After the peace, he became, at court, the principal adviser on military affairs and on questions of foreign policy; was a strong opponent of Law's financial measures; but, through the intrigues of Fleury, lost favor at court. The outbreak of war in 1732, however, brought out the old hero from his retirement, and with the title of "marshal-gen. of the camps and armies of France" he went to head the French army in the Milanese. The campaigns of 1733–34 showed that the weight of years had left Villars's military genius and spirit untouched; but the ill-behavior of his ally, the king of Sardinia, determined him to solicit his recall; and he accordingly set out for France; but falling ill at Turin, he died there, June 17, 1734. Villars was the last of the great military geniuses of the French monarchy, and was wholly free from the restless anxiety for *éclat* which detracts from the merits of so many of them. As a general, he possessed in a high degree rapidity of apprehension, skill in disposition, and promptitude (without precipitancy or rashness) in action. Humanity and sincerity, joined to thorough self-reliance, may be traced through the whole of his long and eventful life; and the two latter qualities occasionally exhibited themselves so prominently at court as to cause the "professional courtiers" of Louis XIV. to look askance upon him as a "rude and *immodest*" person. His memoirs have been printed in Holland, and his autobiography by Anquetil.

VILLARSIA, a genus of plants of the natural order *gentianaceæ*, the species of which are widely distributed over the world, and are either aquatic or marsh plants, with entire leaves and yellow flowers. Villarsia *nymphæoides* is a native of England, but rare. It is more common in many parts of Europe, from Denmark to the Mediteranean, and is very abundant in Holland, often covering large tracts of the canals with its beautiful flowers and leaves. It abounds in the south of Siberia. It is easily cultivated.

VILLEFRANCHE, a t. of France, in the department of Aveyron, is seated on the Aveyron river at its confluence with the Alzou, 76 m. n.e. of Toulouse by railway. It contains many interesting houses of the 15th and 16th centuries, a church of Notre Dame (13–16th cent.), an old Carthusian convent, with interesting Gothic cloisters, and carries on manufactures of copper wares, iron, gray cloths, etc. Pop. '91 (commune), 9734.

VILLEFRANCHE-SUR-SAÔNE, a small industrious t. of France, in the department of Rhône, stands on the Morgon, an affluent of the Saône, 20 m. n. of Lyons, on the Paris and Marseilles railway. It is surrounded by a district studded with charming country-seats, and consists chiefly of a handsome street a mile and a quarter in length. Manufactures of cotton goods are carried on, and there is a great trade in wines, horses, cattle, hides, and cloth. Pop. (commune) '91, 12,928.

VILLEIN. See SERF.

VILLÈLE, JEAN BAPTISTE SÉRAPHIN JOSEPH, DE, 1773–1854; b. Toulouse, France; entered the navy, and made a fortune in the colonies. After being mayor of Toulouse, and representing that city in the deputies, he was appointed minister of finance in 1821. The next year he was given the title of count and made president of the council and minister of foreign affairs. During his administration, but against his will, an expedition was sent to Spain to restore Ferdinand VII. in 1823. He was in high favor with Charles X., whom his ultramontane and extreme royalist policy helped to dethrone. He made the Haytians pay 150,000,000 francs for their independence, and reduced the interest on the public debt; but his reactionary measures, his restrictions on the press, and his partiality for the Jesuits led to his retirement from the ministry in Jan., 1828.

VILLEMAIN, ABEL FRANÇOIS, a distinguished French scholar and writer, b. at Paris, June 11, 1790, and educated at the lycée Impérial (now the lycée Louis-le-Grand). In 1810 he was appointed extraordinary professor of rhetoric at the lycée Charlemagne; and shortly after, maître de conférences de littérature Française et de versification Latine, at the école Normale. During the years 1812–16 three of his literary essays were crowned by the French academy—the *Eloge de Montaigne, Avantages et Inconvénients de la Critique*, and *Eloge de Montesquieu*. In 1816 he was appointed to a chair of modern history at the Sorbonne, as assistant to Guizot; but, in the course of the same year, was transferred by Royer-Collard to the chair of eloquence, which he held till 1826. In 1819, he published in 2 vols. his *Histoire de Cromwell d'après les Mémoires du Temps et les Recueils Parlementaires*—a work written in a calm, liberal, and wise spirit. Louis XVIII. took notice of the author, and Villemain was induced to enter on a political career. The post assigned to him was rather a delicate one, that of chef de l'imprimerie et de la librairie. Under the ministry of M. Decazes, he also held the office of maître des requêtes to the council of state, and in 1820 was decorated with the legion of honor. Two years later appeared his translation (with preliminary essay and notes) of the *Republic* of Cicero; and in 1825, a drama entitled *Lascaris, ou les Grecs du XV. Siècle*, and an *Essai sur l'Etat des Grecs depuis la Conquête Musulmane*. In 1827, having gradually passed over to the ranks of the liberal opposition,

he was charged, along with Lacretelle et Chateaubriand, to draw up the petition addressed by the French academy to Charles X. against the re-establishment of the censorship of the press! The result of this hardihood was the loss of his appointment as maître des requêtes, and, in consequence, a vast increase of his popularity as a lecturer at the Sorbonne. In the beginning of 1830 he was sent to the chamber of deputies by the electoral college of Evreux, took his seat among the liberal party, signed the famous address of the 221, and was altogether very prominent and active in those movements which brought about the constitutional monarchy of Louis Philippe. But he was too sober, unsympathetic, philosophical a politician, too much a *doctrinaire* of the Guizot school, to be a favorite with the excitable masses, and he only sat in the chamber for one year. In 1831 the king named him member of the royal council of public instruction, of which he became vice-president in 1832. The same year witnessed his elevation to the peerage. Villemain held the portfolio of public instruction in the ministries of Soult (1839–40) and Guizot (1840–44); but his health failed under the immense labors of his department, and the impossibility of pleasing so many different parties—the church, the university, the reds, the liberals, the doctrinaires, and the king himself; and, in consequence, he found it necessary to resign. Afterward, Villemain wisely devoted himself to literature alone. His principal works are: *Cours de Littérature Française; Tableau du XVIII. Siècle; Discours et Mélanges Littéraires* (1823); *Nouveaux Mélanges Historiques et Littéraires* (1827); *Etudes de Littérature Ancienne et Etrangère* (1846); *Tableau de l'Eloquence Chrétienne au IV. Siècle* (2d ed. 1849); *Etudes d'Histoire Moderne* (1846); *Souvenirs Contemporains d'Histoire et de Littérature* (1856); *Choix d'Etudes sur la Littérature Contemporaine* (1857); *La Tribune Contemporaine, M. de Chateaubriand* (1857); *Essais sur le Génie de Pindare et sur la Poésie Lyrique* (1859); besides a vast number of essais, etudes, discours, notices, and rapports, addressed to the French academy, of which he was perpetual secretary from 1832. Villemain's elaborate *Histoire de Grégoire VII.*, nearly finished at the time of his death, was published in 1872. Villemain died May 8, 1870.

VILLEMESSANT, Jean Hippolyte de, b. France, 1812; resided some time in Tours and Nantes; settled in Paris as a journalist, 1840; established the *Sylphide*, and wrote fashion articles for the *Presse;* was connected with several papers in 1848, which were suppressed; founded the *Chronique de Paris,* 1850; revived in 1854 the *Figaro* as a weekly and semi-weekly journal, to which Edmond About, Rochefort, and Henry de Péne contributed. In 1866 he issued a daily, whose circulation in 1870 amounted to 70,000. He published *Memoires d'un Journaliste.* He d. 1879.

VILLE'NA, a t. of Spain, in the modern province of Alicante, and 37 m. n.w. of the city of that name by railway. The streets are narrow and winding, and are overlooked by an old castle, which has an imposing appearance, owing chiefly to its elevated position. Around the town, the hills are clad with vines, and the country is fertile. It has numerous distilleries, and manufactories of soap and linen. A great fair takes place here every autumn. Pop. '87, 14,450.

VILLENEUVE, Pierre Charles Jean Baptiste Sylvestre de, Vice-Admiral of France, descended from an ancient and noble family, which has supplied an almost uninterrupted succession of distinguished ornaments to their country, was born at Valensoles, in the department of Basses-Alpes, Dec. 31, 1763, entered the navy in his 15th year, and passed as capt. in 1793. In 1796 he was raised to the rank of "capt. of division" (equivalent to *commodore* in the British navy), commanded the rear-division at the battle of the Nile, and after that disastrous fight, succeeded in carrying off to Malta his own vessel, the *Guillaume Tell,* and four others. In 1804 he was nominated vice-admiral; and in the following year was appointed to the command of the Toulon squadron, with which he succeeded in reaching Cadiz, where he was joined by the Spanish fleet under Gravina. His orders being to attempt the withdrawal of the British fleet from the coasts of Europe, he bore away westward across the Atlantic, reaching the Antilles on May 14, and there making a number of valuable captures. A month afterward, hearing that the British fleet had reached Barbadoes, he at once re-embarked his troops, and returned to Europe, pursued by Nelson. On reaching the Azores, however, he encountered a British squadron, under sir Robert Calder, and a fierce combat ensued, which lasted till dark. On the following morning, neither side cared to renew the engagement (for which Villeneuve was abused by *Le Moniteur*, and Admiral Calder was put on trial), and Villeneuve, unable to reach Brest, again returned to Cadiz, where he was strictly blockaded by Nelson. The unjust severity with which he was treated by Napoleon arose from the fact, that the battle off the Azores, and the subsequent blockade of the French and Spanish fleet in Cadiz, had completely ruined Napoleon's scheme for the invasion of England; and the further indignity of being superseded hurried the unfortunate Villeneuve into the desperate resolve of engaging Nelson before his successor could arrive at Cadiz. Besides, by a stratagem of Nelson, he was led to believe that the strength of his enemy was such as to afford him a favorable opportunity of wiping out the disgrace of his former failures, and he accordingly, in superior force, sallied out of the harbor, and engaged in the memorable conflict of Trafalgar (see Trafalgar, and Nelson). A passage in the instructions issued to his captains on Oct. 20 sufficiently

shows the irritated state of his feelings—"Every capt. who is not under fire is not at his post, and a signal of recall will be a brand of dishonor to him." Villeneuve, whose vessel the *Bucentaure*, was completely dismasted, was forced to strike his flag, and was made prisoner, and conveyed to England, whence he returned to France in April, 1806. Instead of rendering himself at Paris, he stopped at Rennes, with the view of ascertaining the kind of reception he was likely to meet with from the emperor. The result of his inquiries was unfavorable; and on the morning of April 22 he was found dead in bed, with six knife-wounds in his heart. He had died by his own hand.

VILLENEUVE D'AGEN, or VILLENEUVE-SUR-LOT, a t. of France, in the department of Lot-et-Garonne, in a charming valley, 15 m. n. of the town of Agen. The river Lot divides it into two unequal parts, communicating by a remarkably bold bridge of a single arch, which, together with portions of the ramparts, remained standing when the town, formerly called Gajac, was destroyed in the wars of the commencement of the 13th century. A great trade is carried on in wines, prunes, cattle, and iron; there are manufactures of paper, cloth, table-linen, and copper wares. Pop. (commune), '91, 13,798.

VILLERS, CHARLES FRANÇOIS DOMINIQUE DE, 1765–1815; b. France; served in the French artillery. He opposed the revolution, became a resident of Lübeck in 1797, and endeavored to familiarize Frenchmen with the best works in German philosophy and literature. He was exiled from Lübeck on account of his book relating the outrages by the French when they took that city. He was afterward a professor at Göttingen. Among his works are: *La Philosophie de Kant* (1801); *Essai sur l'Esprit et l'Influence de la Reformation de Luther* (1804).

VILLIERS, GEORGE. See BUCKINGHAM, DUKE OF.

VILLIERS, GEORGE WILLIAM FREDERICK. See CLARENDON, EARL OF.

VILLOISON, JEAN BAPTISTE GASPARD D'ANSSE DE, 1750–1805; b. France; went to Venice in 1778, commissioned by the government to look for unpublished Greek manuscripts in the library of St. Mark, where he found an *Iliad* MS. of the 10th c., which he published in 1788. His *Anecdota Græca*, also containing results of his search at Venice, appeared in 1781. In 1783 he printed *Epistolæ Vimarienses.*

VILNO (often written VILNA), a government of west Russia, bounded on the w. by Poland, from which it is separated by the Niemen, and on the e. by the government of Vitebsk, from which it is separated by the western Dwina, and by that of Minsk. Area, 16,421 sq.m.; pop. '96, 1,594,809, mostly Lithuanians, Slavonians, Jews, and Tartars. Only 18 per cent of the whole population are Poles. The rivers are the Vilia, Beresina, affluents of the Niemen, and the Disna, which flows n. into the Dwina. The surface is flat; the highest part being only 1100 ft. above sea-level. The soil, in some places very fertile, consists for the most part of clay and sand. Marshes abound, and there are 400 small lakes. The woods which cover the marshes are the great source of the wealth of the government. The principal trees are fir and pine, and the timber is floated down the Niemen and Dwina for export, and used in the interior for ship-building, etc. The climate is mild. There are a good many manufactories in the government; but agriculture is the principal occupation of the inhabitants, and fairs are numerous and important.

VILNO, an important city of west Russia, capital of the province of the same name, picturesquely situated on the Vilia, 473 m. s.w. of St. Petersburg. Besides its cathedral, it is remarkable for the number of its religious edifices, among which are a mosque, several synagogues, and Lutheran meeting-houses. It formerly contained a university, founded in 1576, but abolished in 1832. Among existing institutions, the chief are the observatory, medical society, museum of antiquities, and theater. The principal articles of trade are timber and corn. Manufactures are not important. Pop. '97, 159,568.

VIMIEIRA, a small town in the west of the Portuguese province of Estremadura, where Wellington defeated the French under Junot, 1808, Aug. 21st.

VINAGO, a genus of *columbidæ*, the most marked section of that family, having a comparatively stout solid bill, laterally compressed; with a hard, hooked, and inflated tip; the tarsi short, the feet large, and formed for perching or grasping. The species, of which not many are known, are natives of the tropical parts of Asia and Africa.

VINASSE. After all the crystallizable sugar is obtained from beet syrup a molasses remains, which is subjected to distillation, producing rum. Vinasse is the liquor left in the retort at the end of the distillation. If the concentrated Vinasse be subjected to destructive distillation, and the gases condensed, an ammoniacal liquor is obtained, which contains trimethylamine salts—valuable chemical compounds, which by this process are obtained for the first time in any considerable quantity.

VINCA. See PERIWINKLE.

VINCENNES, a commune and market-t. of France, in the dep. of Seine, 5 m. e.s.e. of the Louvre in Paris. In reality, the town is merely a great fortress and barracks, and is famous for its arsenal, and for its school for the practice of shooting. At the latter, the chasseurs de Vincennes, and all the best marksmen of the army, are trained. Pop. '91, 20,358.

Vincennes owes its historical importance to its castle and park. The chateau, the main object of interest in the town, is rectangular in shape, and dates from the middle of the 14th century. It was surrounded by nine towers, which were in existence down

to the the year 1808, but of which only one, known as the Donjon de Vincennes, 170 ft. high, and with walls 17 ft. thick, remains. The original building dates from the reign of Louis VII., and had its origin in a hunting-lodge, erected here by that sovereign in 1137. Philippe-Auguste enlarged it, and stocked its woods with wild animals, sent to him by the king of England. Here queen Jeanne (wife of Philippe le Bel), Louis le Hutin, and Charles le Bel, ended their days. Philippe de Valois caused the old mansion to be demolished, and laid the foundations of the more modern chateau, which, from the middle of the 14th c. till the time of Louis XV., was a royal residence, and the birthplace and place of death of many princely personages. After this time it was used as a prison, and among the famous men who have languished within its donjon, may be mentioned Henry IV., the prince of Conde, Cardinal de Retz, Mirabeau—who here wrote his translation of Tibullus—and the duc d'Enghien, who was shot in the moat of the castle by order of Bonaparte. There are extensive barracks, known as the New Fort, built 1848–52, and a salle d'Armes, with a large collection of all sorts of weapons. In the center of the Bois de Vincennes, a large tract has been cleared as an exercise ground for troops, and for rifle and artillery practice.

VINCENNES, city and co. seat of Knox co., Ind.; on the Wabash river, and the Baltimore and Ohio Southwestern, the Cleveland, Cincinnati, Chicago, and St. Louis, the Evansville and Terre Haute, and the Pennsylvania Co.'s railroads; 58 miles s. of Terre Haute. A French fort was built here in 1702; the British gained possession in 1763, Virginia in 1779, and the United States in 1783; the city was the capital of Indiana in 1800–13; and received a city charter in 1856. It is the oldest settlement in the state. The city contains Vincennes university, St. Francis Xavier cathedral, St. Rose academy, city and cathedral libraries, high school, St. Vincent's orphan asylum, orphans' home, Harrison park, attractive railroad and highway bridges, and, near by, several fine specimens of Indian mound-building. There are gas and electric lights, electric street railroads, several national banks, about 15 churches, and manufactories of sewer pipe, stoves, jewelry, plows, paper, carriages, and wagons, flour, and foundry, machine shop, and wood-working products. Pop. '90, 8853.

VINCENNES, Jean Baptiste **BISSOT**, Sieur de, 1688–1736; b. Quebec. He was very active in the Indian troubles of the time. In 1704 rescued some Iroquois from a band of Ottawas, who had taken them prisoners, contrary to treaty stipulation, and thus prevented a general war. In 1712 he was engaged in contests with the Fox Indians near Detroit, and about the same time founded the town which bears his name. In 1736 he had command of an expedition against the Chickasaws, was defeated, and with Father Senat, D'Artagnette, and others, was burned at the stake.

VINCENT, John Heyl, D.D., was b. in Tuscaloosa, Ala., in 1832; educated at Lewisburg academy and at Wesleyan institute; and entered the Methodist Episcopal Church. In 1865 he established the *Northwest Sunday-School Quarterly* at Chicago, and in 1866 the *Sunday-School Teacher;* and in 1868–84 had the direction of the Sunday-school work of his denomination. He was one of the founders of the Chautauqua assembly and chancellor of the Chautauqua university from its organization. In 1888 he was elected bishop. He wrote several volumes for the Chautauqua text-book series.

VINCENT, Marvin Richardson, D.D., b. Poughkeepsie, N. Y., 1834; graduated at Columbia coll., N. Y., 1854; was first classical instructor of the grammar school of Columbia coll., 1854–58; prof. of Latin, Troy univ., 1858–62; pastor of the First Pres. church, Troy, N. Y., 1863–73; of the church of the Covenant (Pres.), N. Y., 1873–88; and became a professor in Union theolog. seminary, New York, 1888. He published a translation of Bengel's *Gnomon of the New Testament*, with Dr. Charlton T. Lewis (1862); *Amusement, a Force in Christian Training* (1867); *The Two Prodigals* (1876); *Gates into the Psalm Country* (1878); *Stranger and Guest* (1879); *Faith and Character* (1880); *The Minister's Handbook* (1882); *In the Shadow of the Pyrenees* (1883); *The Expositor in the Pulpit; God and Bread* (1884); *Word Studies in the New Testament* (1889); *Biblical Inspiration and Christ*, and *That Monster, the Higher Criticism* (1895); *The Age of Hildebrand* (1896); *Philippians and Philemon* (1897), etc.

VINCENTIAN CONGREGATION, so called from its founder, the Roman Catholic saint, Vincent de Paul, is an association of secular priests, who, although not in the strict sense a religious order, are bound by vows, and are especially devoted to the duty of preaching and hearing confessions among the people, particularly the poor. Another object of the Vincentian congregation is to undertake the direction of episcopal seminaries and other colleges for the education of ecclesiastics, as also to direct the annual devotional exercises of the secular clergy, called ecclesiastical retreat. See Paul, Vincent de. At the latest recorded enumeration which has come under our notice, the congregation numbered above 700 members, in France, Italy, Poland, the Levant, and Algeria. The members are numerous also in America, and branches exist in Ireland and Scotland. The name Vincentian is sometimes given also to the sisterhoods (of which there are several, and of which that of charity is the most remarkable), which were founded by Vincent de Paul, and even to the charitable lay association, better known as the society of St. Vincent de Paul, which has extensive ramifications in almost all the countries in communion with the church of Rome, and which has been the occasion of certain recent restrictive measures in France.

VINCENT, SAINT. See Saint Vincent.

VINDHYA MOUNTAINS. See India.

VINE, a term sometimes used to designate any climbing plant, especially if shrubby, but also more particularly applied to the species of the genus *vitis*, of the natural order *vitaceæ*. This genus has *pentamerous* flowers (5-toothed calyx, 5 petals, 5 stamens), and has the petals united into a kind of hood and deciduous. The most important species is the GRAPE VINE (*V. vinifera*), from the fruit of which wine and raisins are made. The name grape is from the French *grappe*, a bunch of grapes; from the same root as *gripe* or *grab*, to grasp.

The grape vine has large, angular, lobed, toothed, and more or less hairy leaves. The stems are numerous and branching, very long, and of rapid growth, with many tumid joints, the outer bark readily splitting and peeling off, the woody tissue abounding with vessels of large size, from which at the seasons of active vegetation, if the branch is wounded or cut across, the sap pours in prodigious quantity. The fruit-stalks, which are much branched, are opposite to the upper leaves, or in their stead are tendrils. The flowers are small, greenish white, and fragrant. The fruit is a round or oval berry, 2-celled and 4-seeded, varying much in size and color—in the small Corinth or currant grape, about ¼ of an inch in diameter; in the largest varieties, more than half an inch; green, yellow, red, purple, and sometimes variegated; but the color is entirely in the outer skin, the juice being always colorless; and while the pulp of the grape is wholesome, nutritious, and gently laxative, the skin is astringent and indigestible. Some of the ovules are often abortive, or even all of them in the fruit of old vines of some varieties, as in the seedless Ascalon or Sultana raisins.

The vine attains a large size, the stem being sometimes 18 inches in diameter, so that the wood, which is very hard and durable, has been employed for making furniture, statues, etc. It attains also a very great age, continuing fruitful for at least three or four hundred years.

The grape is one of the most valuable of fruits, not only because of its use in the manufacture of wine, and as the source also from which brandy, vinegar and tartaric acid are obtained, but because, both in a fresh and dried state, it forms not a mere article of luxury, but a great part of the food of the inhabitants of some countries. Dried grapes, under the names of *raisins* and *currants*, are a considerable article of commerce. Fresh grapes are commonly eaten with bread in Syria, and some other countries in which they abound. The usefulness of the grape is increased by its keeping fresh for many weeks in a cool airy place. Some varieties are more easily kept than others. More than 1500 varieties are described in works on the culture of the grape; and this subject, under the name *ampelography* (Gr. *ampelos*, a vine), has been elevated by some recent German writers almost to the rank of a distinct branch of science. The quality of the grape is extremely liable to be affected by circumstances of soil and climate, and this is particularly to be observed in the wine produced from it, the difference between the produce of two vineyards in the same neighborhood being often very remarkable.

The vine dislikes a damp soil, but will thrive in almost any open soil with good drainage. In rich deep soils it grows luxuriantly, and produces abundance of large fruit; but on shallow, dry soils, the fruit, though less abundant, is of finer flavor. The vineyards most celebrated for the excellence of their wines are not generally of rich soil. The steep slopes of hills are often planted with the vine, and are sometimes terraced for this purpose; and nothing can be more suitable to situations where patches of good soil are mingled with bare rocks, nor anything more beautiful than the rocks covered with luxuriant foliage and rich fruit. This mode of cultivation on steep rocky slopes was anciently very prevalent in Judæa.

It is doubted of what country the grape-vine is a native, nor is it known at what time, certainly very remote, its cultivation was first introduced into the s. of Europe. It is now found wild in some parts of Europe, but is rather naturalized than truly native. It seems probable that it is indigenous in the hilly countries on the s. of the Caspian sea, where it is very abundant and luxuriant, climbing to the tops of the loftiest trees, and producing large bunches of delicious fruit. But it is doubted if *vitis Indica*, a native of the n. of India, abounding in some parts of the Himalaya, is really a different species. The wild grapes of these mountains are round and purple, and very agreeable. It is doubted also by some if any of the wild grapes of America are really distinct; some of which, however, are much more different in their characters and qualities from the common form of the cultivated plant. Of these American grapes, the FOX GRAPE (*V. labrusca*) is the most similar to the cultivated grape. It is common throughout great part of North America, and is found as far n. as Quebec. The berries are large, deep blue, with thick skin and tough pulp, but make good wine, and have been found capable of much improvement by cultivation; their color also varying to red and white. The SUMMER GRAPE (*V. æstivalis*), not found n. of lat. 42°, has smaller and more agreeable berries, which are regularly brought to the Philadelphia market. Very similar to this is *V. sinuata*, a native of Virginia and Carolina, from the fruit of which good wine is made. The BULLACE GRAPE (*V. rotundifolia*), found only as far n. as lat. 39°, has larger grapes than any other American species, and of agreeable flavor. There is also a species, the FROST GRAPE (*V. cordifolia*), with small berries, and a variety (*V. riparia*) found abundantly on gravelly banks of rivers in the western states, which has exquisitely fragrant flowers. But the habit and leaves of all these differ very little from those of the common vine. Nor does the WATER WITHE of Jamaica, so called from the great quan-

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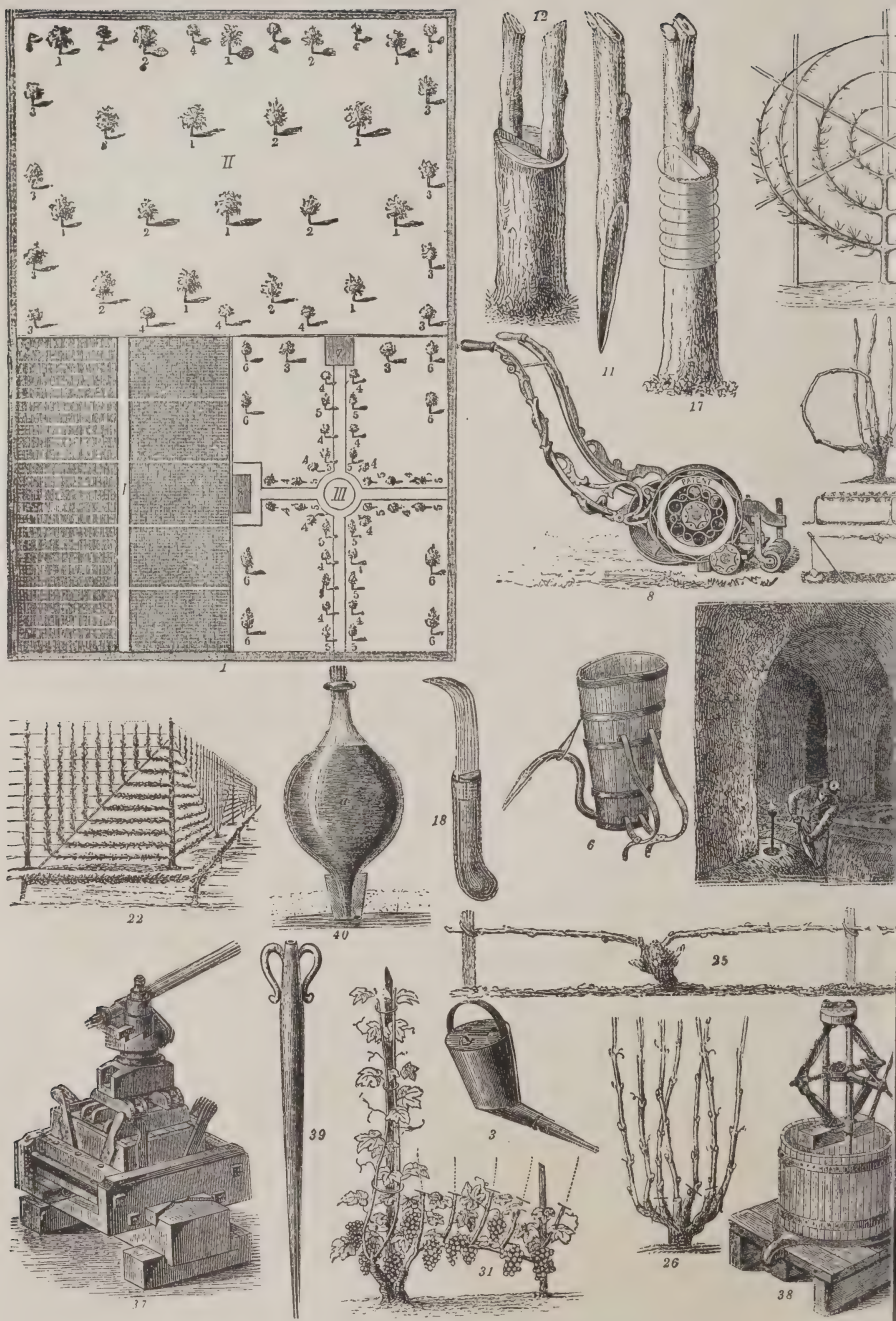

VINE AND FRUIT CULTURE.—1. Plan of a model garden. 2. Garden plot. 3. Dutch sow
9. Mushroom cellar. 10. Entrance to mushroom cellar. *Orcharding:* 11 to 17. Gra
branched trellis. 22. Multiple trellis. 23. Cider-mill. 24. Fruit-dryer. *Vinicult*
33. Wire-stretcher. 34. Sulphur box. 35. Sulphuring vines. 36. Preserving tabl
for wine cellars.

-horn. 4, 5. French hand-sower. 6. Watering-pot. 7. Watering-cart. 8. Lawn-mower.
g. 18. Fruit-knife. 19. Circular hedge. 20. Single-branched trellis on wire. 21. Double-
: 25 to 29. Grape-vine trellis. 30. Arbor. 31. Rhenish summer trellis. 32. Hand-spike.
rapes. 37. Rhenish spindle-press. 38. French lever-press. 39. Pipette. 40. Bottle-filler

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tity of sap which its shoots pour out when cut (*V. Caribbæa*), differ in very marked botanical characters; although its small black berries, which it produces in immense quantity, are acid and austere.

The cultivation of the grape and the making of wine are of the most remote antiquity, as appears from the Scripture history of Noah, and from many passages of the most ancient authors. The mythological fable of the marches of Bacchus relates to the extension of the culture of the vine from Asia into Europe. The earliest accounts we have of the manner of cultivating the vine are by the Roman authors Virgil and Columella. The vine was probably introduced into the s. of France as early as into Italy; it is said to have been brought to Marseilles by the Phocæans, about 600 B.C., and its cultivation was early co-extensive with civilization in all the countries near the Mediterranean. In Italy, so much of the land was occupied by vineyards, that the emperor Domitian, fearing a scarcity of corn, issued a restrictive or prohibitory edict 81 A.D., which was afterward long continued in force, through fear that the abundance of fine wine might tempt the barbarians of the n. to invade the country. The vine was introduced into the s. of Germany about the 3d c. B.C. Augustus preferred the Rhætian wine to all other. The first vineyards on the Rhine and Moselle were planted by the emperor Probus in 281 A.D. Under the Merovingians, the culture of the vine extended greatly both in France and Germany. Charlemagne derived a very considerable revenue from the vineyards even of the northern parts of his empire. The Huns who remained in a number of settlements on the Rhine, after the expedition of Attila into Gaul, 451 A.D., brought thither the arts of cultivating the grape, and of making wine, from Pannonia; and Hunnish grapes and Hunnish wine were long in particular repute. In the middle ages, the monks were the first to plant vineyards and to make wine in many parts of Europe.

The cultivation of the vine was introduced into England by the Romans. At the time of the Norman conquest, there seem to have been vineyards in the s. and s.w. of England, and, although they afterward disappeared, successful attempts were occasionally made to re-establish them; and one at Arundel castle in Sussex yielded, about the middle of last century, large quantities of wine. Of late years, the cultivation of the vine has much increased in the s. of England, in gardens, on the walls of suburban villas and of cottages, but chiefly for the sake of the fresh fruit, although wine of pretty good quality is also made in small quantities for domestic use.

The vine does not, in ordinary seasons, ripen its fruit well in Great Britain further n. than Yorkshire, although grapes have occasionally ripened in the open air in Scotland. It is, however, a hardy plant, in so far as the endurance of severe winter-frosts is concerned; but it requires for the ripening of its wood, as well as of its fruit, a considerable summer heat continued for several months. Thus, it does not succeed in parts of Britain in which the mean temperature of the year is higher than that of countries where good wine is made. A very moist climate is also unsuitable to it; and therefore it is not extensively cultivated in the n.w. of France, although there are many productive vineyards in the n.e. In the most northern regions to which its cultivation extends, the vine is protected in various ways during winter; in some places, by laying down its branches, and covering them with some depth of earth. It produces abundant fruit in warm climates, such as India, but the juice passes too rapidly into acetous fermentation to be used for making wine, although in many of the mountainous districts of India it might probably be cultivated for this purpose with success. Shiraz, in Persia, is one of the warmest climates celebrated for the production of good wine.

In Europe, the cultivation of the vine forms an important branch of rural economy as far n. as Coblenz on the Rhine; but in some countries, particularly in Greece and the Ionian islands, raisins form the chief part of the produce of the vineyards.

The cultivation of the vine was early introduced by the Spanish and Portuguese into the Azores, the Madeira and Canary isles, and America. The first vines were carried to the cape of Good Hope by the Dutch in 1650; but while the wines of Madeira and those of the limited district of Constantia at the cape of Good Hope have long enjoyed a high celebrity, and those of Canary and Teneriffe have been imported in considerable quantities into Europe, it is only of late that much attention has begun to be paid to the cultivation of the grape in the other parts of Cape Colony, or in any part of America. It is now, however, prosecuted with energy in Ohio, New York, California, and other states of North America, and very good wines are produced. It has also been introduced into Australia, where good wines are made, although not yet to a large extent.

The cultivation of the vine varies much in different countries. Success seems chiefly to depend on a good sunny exposure, liberal but not coarse manuring, and constant attention. New varieties are raised from seed, but the ordinary modes of propagation are by layers and cuttings. Fine varieties are sometimes budded or grafted on less valuable ones. In the vineries of America, the vines are carefully trained, in various ways, so as most completely to cover the walls and trellises, and to turn the whole available space to the utmost account; while superfluous shoots are displaced by pruning, so that the strength of the plant may be directed to the fruit-bearing branches, and that there may be no undue luxuriance of foliage to prevent sufficient access of light and air. The luxuriant growth of the plant renders the frequent application of the pruning-knife necessary during summer. The fruit being produced on shoots of the current year, the pruning is managed with a view to the abundance of these shoots, the greater part of which, when

they have served their purpose, are cut away, such only being left as are required for the extension of the space profitably occupied by the plant. The bunches of grapes are also generally thinned out with great care, in order that finer fruit may be produced.

The first attempt at the culture of the vine in the United States for wine-making was in Florida, in 1564; and another was made by the British colonists in Virginia, in 1620. Early in the 18th century certain vineyards in the latter state produced as much as 750 gallons of wine per annum; and in Delaware, wine was made from native grapes as early as 1648. In 1664 the governor of New York granted to one Saul Richards the privilege of making and selling wine, free of duty. In 1683 William Penn engaged in the cultivation of the vine, near Philadelphia, but with only partial success. In 1790 a Swiss colony made unsuccessful attempts to establish vineyards in Jessamine co., Ky.; and afterwards removed to Vevay, Ind., where they met with better fortune. In Illinois, 110 hogsheads of wine were made from native grapes in 1796; and, near the end of the last century, wine was made in Pennsylvania from the Schuylkill Muscatel grape, which was the same employed in Indiana. In 1825 the Catawba vine, a native of North Carolina, came into prominence; and it was afterwards cultivated extensively near Cincinnati by Nicholas Longworth, who may be called the father of this culture in the United States. In California, viticulture, introduced by the Franciscan fathers, was successful from the beginning, and, how well adapted the soil and climate are, is shown by the fact that a single vine of what is called the Mission variety, planted about 1823 by a Mexican woman, was reported in 1890 to have a diameter, one foot from the ground, of 12 inches, to cover an area of 12,000 feet with its branches, and to bear annually from 10,000 to 12,000 pounds of grapes, many bunches weighing six and seven pounds. One vineyard, in Tehama county, is the largest in the world (4000 acres), and another at Folsom, Sonora county, contains 1500 acres. The first grape planted, the Los Angelos, or Mission variety, was the only one grown until 1820. More than 30 varieties of European grapes, adapted for wine-making, are grown in the open air, including the Black Hamburg, Trousseau, Charbonneau, Herbemont, Berger, Zinfandel, and Malbeck, and the Muscatel de Gordo Blanco, and other raisin grapes. Four-fifths of the grapes grown in New York, Pennsylvania, and New Jersey are used for table purposes. The Lake Keuka, Hudson River, and Chautauqua districts in New York produce the largest amounts. Among the varieties most largely grown are the Concord, Catawba, Delaware, Moore's Early, Niagara, Diana, Worden, and Isabella. In Ohio, the industry is mainly found on the Lake Erie islands and in the counties bordering the lake, nearly all the product going to western markets for table use, the remainder being converted into wine and champagne. The Southern States are taking increased interest in viticulture, and the early grapes of Georgia and Florida reach northern markets several weeks in advance of those from northern and western states. The Niagara is a favorite variety in the south. Missouri vineyards are less productive than formerly. New Mexico and Arizona are assuming prominence in this industry. In New Mexico the Zinfandel, Mataro, Cabernet, Sauvignon, Cabernet Franc, Mission, Petite Piro and Chassolas Fontainebleau are successfully grown for wine, and the Muscat of Alexandria, Muscatel and Sultana for raisins. According to the census of 1890, the grape-growing districts of our country comprised 401,261 acres, of which 307,575 acres were in bearing, producing 572,139 tons, of which 240,450 tons were used for wine, making 24,306,905 gallons; 41,166 tons for raisins, making 1,372,195 boxes of 20 pounds each; and 23,250 tons for dried grapes and purposes other than table fruit. The total value of plant, including land, was $155,661,150, and the laborers employed, 200,780. Only about one person to three acres is directly employed in growing grapes. California had 200,544 acres in vines; New York, 51,000; Ohio, 33,000; Missouri, 11,274; Virginia, 5700; Kansas, 5542, and North Carolina, 5200. The average yield of grapes per acre ranged from three tons in Arizona, Missouri, and New Mexico, to 1.75 in Indiana, New York, and North Carolina, and the market value per ton from $96 in Georgia to $16.50 in Arizona. From our native vines a vast number of varieties have been derived, such as the Catawba, Isabella, and Scuppernong. The Concord is deservedly popular in the Eastern States, because it proves reliable in almost all locations and soils. Among the chief enemies of the vine are fungoid growths, mildew (see Oidium), rot, and the *phylloxera vastatrix*. (See Phylloxera.)

The phylloxera has been most successfully combated in Europe by grafting susceptible vines into stock raised from the seeds of American wild grapes. *V. riparia* is considered the best for this purpose, but *V. æstivalis*, *V. vulpina*, *V. Labrusca*, and other species and varieties are also used. In the United States kerosene emulsion and bisulphide of carbon are efficacious.

The juice of ripe grapes contains a considerable quantity of *grape-sugar* (see Sugar), small quantities of a glutinous substance, and of extractive bitartrate of potash, tartrate of lime, a little malic acid, and other ingredients, suspended or dissolved in water. The rapidity with which it passes into a state of fermentation after being expressed from the fruit is remarkable.

For the making of wine, the wine-trade, the qualities and uses of wines, the different kinds of wine, etc., see Wine. Concerning the other commercial products of the grape, see Brandy, Vinegar, Tartaric Acid, Raisins, and Currants.

VINEGAR is that form of Acetic Acid (q.v.) which is generally preferred for culinary purposes, and which is made by the fermentation of vegetable substances. In the U. S. it is manufactured on a large scale from the so-called hard cider; on the continent of Europe, it is as largely made from low wines which have turned sour Malt, or British vinegar, as it is sometimes called, is made by brewing a weak wort from malt exactly as for beer (q.v.). To 100 gallons of this, at a temperature of 70°, are added 4 gallons of yeast, and well stirred through for 8 or 10 minutes. This mixture is then allowed to ferment actively for two days, and is then transferred to the stoving-room; here it is distributed into a number of tubs, which. when filled, are covered over with a coarse canvas. This room is dark, and is heated by stoves, and the heat is constantly sustained for weeks until the conversion of the wort into vinegar is complete. The process of acetification is accelerated by introducing into the casks with the wort either the residuary fruit used in making domestic wine, or the foot stalks and skins of grapes. This *rape*, as it is called, acts as a kind of ferment. Other processes are used by different manufacturers for the purpose of producing it quicker; but the minute descriptions necessary to render them clear would be out of place here. Much vinegar is also made of beer which has become sour; it is, however, very inferior in quality, and wants the agreeable flavor of malt vinegar prepared by the above process, which is due to the presence of acetic and other ethers.

A rather insipid kind of vinegar is made by means of the vinegar-plant (q.v.). The vinegar-plant itself may be produced thus: A solution of a quarter of a pound of sugar and half a pound of treacle in three quarts of water is first simmered, then poured into a jar, covered up, and kept in a warm place for six weeks. The liquid becomes vinegar, and on the top there has been formed a scum-like fungus, which is the vinegar-plant; and by adding a piece of this to a similar solution, the process of conversion into vinegar now takes place in much less time. During the process, the plant thickens by the formation of a new layer on its under surface; and by peeling off this layer, and using it in a fresh operation, the plant may be propagated indefinitely.

The greatest manufacture of *wine vinegar* in Europe is at Orleans, in France. Here the wines are sent from all parts when unfit for drinking, and are converted into vinegar. In the manufacture a large number of casks are used, with openings into each of only two inches diameter. Into each one are poured 100 pints of vinegar boiling hot; and to this, after eight days, are added 10 pints of sour wine, and this is repeated every 8 days until the cask is full; another 15 days completes the process, and the vinegar is ready for use. Beech-shavings are much used in vinegar-making, as they are found to assist in clarifying the liquor by attracting the lees, which settle upon them, and leave the liquor clear, in which state it acetifies more rapidly.

"According to Ure, a good vinegar may be prepared by adding to each gallon of a syrup composed of 1¼ lb. of sugar and 1 gal. of water, a quarter of a pint of yeast. If kept for three days at a temperature of 75° or 80°, it will be sufficiently acidified to allow of being drawn off into the refining-cask, where one ounce of bruised raisins and one ounce of crude tartar are to be added to each gallon of liquor. When the sweet taste has quite disappeared it should be drawn off into bottles, and corked down tightly. It is stated that such vinegar will contain 5 per cent of pure acetic acid."—Miller's *Organic Chemistry*, 2d ed. p. 339. Vinegar prepared by these methods contains a large amount of foreign matters, which can be got rid of by simple distillation; the acid liquid which comes over constituting what is known in pharmacy as *distilled vinegar*. What is sold commercially as distilled vinegar is simply ascetic acid distilled from wood (See Pyroligneous Acid), and diluted with five times its volume of water. This constitutes also the vinegar used by pickle manufacturers; it is quite as wholesome as common vinegar, but wants its agreeable flavor; its preservative powers are, however, much greater, and its price very much less, if fairly charged. Vinegar containing five per cent of the pure acid is the strongest that is ever produced, and is termed *proof vinegar*. There are four kinds manufactured, which are known in trade by the numbers 18, 20, 22, and 24, the last being the best quality. The strength of any specimen is best ascertained by determining the quantity of anhydrous carbonate of soda which a given weight of it will neutralize, it being recollected that 100 grains of carbonate of soda correspond to 96.2 grains of anhydrous acid. The ammonia test, according to Neligan, serves to distinguish French from English vinegar: with the former, the color is purplish; with the latter, there is either no change, or it is brownish. There is generally a slight turbidity, which is due to a trace of lime.

As a condiment, vinegar is an ingredient of a large number of sauces, and of all ketchups and pickles; and although it cannot be regarded as an essential article of food, its applications in cookery are numberless. Young ladies, with an undue tendency to corpulency, sometimes drink vinegar freely with the view of improving the figure; but as vinegar only causes thinness by injuring the digestion, it is obviously not worth while that they should run the risk of exchanging slight fullness of habit for chronic dyspepsia.

Vinegar is used in medicine as a cooling astringent, and may be employed with much benefit if taken freely, when largely diluted with water, in hemoptysis, in hematemesis, and in the colliquative sweating of hectic fever. Dr. Neligan states that in severe hiccough, he has often seen benefit derived from a dose of a wine-glassful of vinegar. In cases of poisoning with the alkalies or their carbonates, it is one of the best antidotes.

It may also be employed locally in various ways—as, for example, to check hemorrhage from the nose, womb, etc. In intestinal hemorrhage, an enema containing vinegar and cold water may be used with success, especially if the lower part of the intestine be the seat of the bleeding. Sponged in a diluted state (one part to three of cold or tepid water) over the neck, chest, etc., it affords great comfort and considerable relief in cases of colliquative sweating. In its character of a refrigerant rather than as an astringent, its local action on the skin is attended with much benefit in the treatment of most febrile and inflammatory diseases; it should be freely applied, as in colliquative sweats, to the surface of the body, face, and extremities; and thus employed, has a very tranquillizing effect, and often induces sleep. The heat and pain commonly experienced in sprains are often relieved by the local application of brown paper soaked in diluted vinegar, and changed when the feeling of heat returns. It is an important addition to astringent gargles in cases of relaxed uvula and tonsils; and is the best application to the eyes in cases in which lime has got within the eyelids. The ordinary dose is from 2 to 4 drams; and when taken as a drink, 3 ounces may be mixed with a pint and a half of water, and taken in the course of the day.

The term *Chili vinegar* is applied to a preparation obtained by infusing half an ounce of cayenne pepper in a quart of French vinegar for ten days, and straining. It is commonly added to gargles in the proportion of 1 ounce to 8 or 9 ounces of infusion of roses, in cases of relaxed sore throat.

Aromatic Vinegar, known also as *Vinegar of the Four Thieves*, *Marseille Vinegar*, and *Camphorated Vinegar*, and *Camphorated Acetic Acid*, consists of strong acetic acid, holding in solution camphor and the oils of cloves, lavender, rosemary, and lemons. It is very fragrant and volatile, and must be kept in well-stoppered bottles. It was formerly regarded as a valuable prophylactic of all infectious diseases, but is now only used as an external stimulant, the vapor being applied by a smelling-bottle to the nostrils in cases of fainting.

VINEGAR-PLANT, *Pencillium glaucum*, a fungus of the sub-order *hyphomycetes*, but somewhat resembling those known by the name of Mould (q.v.). It forms a flocculent mass or web, which is tough and crust-like or leathery, and when examined by the microscope, is seen to consist of a *mycelium* of branched threads, with the branches somewhat tangled, and the spores disposed in patches about the pencil-shaped ends of fertile threads. It is found on decaying bodies and in fluids undergoing the acetous fermentation which it greatly promotes, and which, indeed, it very readily occasions, a small piece placed in sugar and water soon changing it into vinegar. Advantage is sometimes taken of this property for making vinegar.

VINELAND, a borough in the township of Landis, Cumberland co., N. J.; on the Central of New Jersey and the West Jersey and Seashore railroads; 10 miles e. of Bridgeton, 35 miles s.e. of Philadelphia. It is regularly laid out on a plot 1 m. square. The principal avenues are 100 ft. wide; the other avenues and streets 66 ft.; and are bordered with shade trees. The houses are surrounded by vineyards, orchards, and flower gardens. The tract in which is the borough covers an area of 48 sq. miles. It was purchased in 1861 by Charles K. Landis, and is divided into fruit farms of 5 to 25 acres. It lies chiefly in the township of Landis, Cumberland co., but extends to Buena Vista, Atlantic co., and Franklin, Gloucester county. Among the noteworthy buildings and institutions are the New Jersey training school for feeble-minded children, the New Jersey home for feeble-minded women and children, college of the Sacred Heart, public park of 20 acres, and the Vineland historical society. There are national and state banks, over a dozen churches, waterworks, gas lighting plant, central high school, several public and private schools, a kindergarten, and daily, weekly, and semi-monthly periodicals. The distinctive industry is fruit-growing. There are also manufactories of shoes, pearl buttons, chenille, rugs, glass, iron and brass foundry products, machine work, and saw mill products. The sale of intoxicating liquor is prohibited. The climate here is singularly mild in the winter, and favorable for invalids. Pop. '90, 3822.

VINES, Richard, about 1585–1651; b. England. In 1616, or about that time, he established a settlement at Saco Bay, Me., acting as the agent of sir Ferdinando Gorges. In the pestilence of the winter of 1616–17, his medical skill was of great aid to the Indians. In 1617 he ascended the Saco river as far as Crawford's Notch. The village of Biddeford was founded on land granted to Vines by the Plymouth company in 1629.

VINET, Alexandre-Rodolphe, Swiss divine and author, was b. at Lausanne, June 17, 1797, and received his education in his native city as a student of the Protestant church, of which he was ordained a minister in 1819. From an early age he showed a passionate fondness for the study of French literature, which he cultivated with so much success that at the age of 20 he was appointed professor of French language and literature in the gymnasium of Basel. This position he held till 1837, when he removed to Lausanne to fill the chair of practical theology in the academy of that city, which chair, however, he resigned in 1840, when he seceded from the national church, on account of the new constitution imposed upon it in that year. Notwithstanding his resignation, he appears to have continued his lectures either in the academy or privately; and in 1844 again connected himself with that institution as substitute-professor of French literature. Vinet took a leading part in the formation of a constitution for the Free church of Vaud, formed by those who seceded from the national church in

1845, this secession having been in a great measure the result of the influence of his own writings and teachings in favor of the separation of church and state. He died May 14, 1847. Vinet was an eloquent and earnest preacher, clear and brilliant rather than profound in thought; and although highly evangelical and orthodox, advocated the utmost liberty and toleration of opinion and practice in matters of religion. He wrote largely both on literature and religion, and most of his works have been translated into English. His works on French literature show that he was thoroughly acquainted with its history, and possessed the critical faculty in no mean degree; as a philosophico-religious writer, he is very popular among the educated religious public both in England and America. His principal works are: *Chrestomathie Française* (3 vols. 1829); *Histoire de la Littérature Française au XVIII. Siècle; Etudes sur la Littérature Française du XIX. Siècle* (3 vols.); *Mémoire en Faveur de la Liberté des Cultes* (1826); *Discours sur quelques Sujets Religieux* (1831); and *Nouveaux Discours*, etc. (1841)—from which two last-mentioned works selections have been translated into English, and published under the title of *Vital Christianity; Etudes sur Blaise Pascal, Études Evangéliques*, and *Nouvelles Etudes Evangéliques*, which have been rendered into English as *Gospel Studies;* etc.

VINEYARD SOUND, a passage 20 m. long and 6 m. wide between the Elizabeth Islands, off the s.e. coast of Massachusetts and the island of Martha's Vineyard; the customary course for vessels sailing from Boston to southern ports.

VINGT-ET-UN (Fr., "twenty-one") is a game played with a complete pack of cards and any number of persons. It consists mainly in endeavoring to get cards whose spots will aggregate twenty-one. Each member of the party deposits an equal stake in the pool, and two cards are dealt, one at a time, to each player. A twenty-one found in hand after the second deal is called a *natural vingt-et-un*, and, if the company has previously so decided, entitles the holder to deal and double stakes from all. In case of the absence of a natural *vingt-et-un* each player in turn calls for a card, and continues to do so until he holds in his hand a combination making twenty-one, or some number near but below it; a player going beyond twenty-one subjects himself to the forfeiture of his stake; it is therefore wise to *stand*, or cease to call for cards at seventeen. Frequently the entire pack is dealt, the winner of the game being he who holds the number twenty-one or that nearest to it.

VINIC ACIDS, an important group of acids, whose mode of formation may be thus described: When a mixture of concentrated sulphuric acid with any of the alcohols is heated to about 212° F. (100° C.), chemical action takes place, and the result is the formation of a new coupled or conjugated acid, in which the radical of one molecule of the alcohol takes the place of one atom of hydrogen in the sulphuric acid. In these compounds, the existence of sulphuric acid can no longer be detected by the addition of baryta; the new acids forming soluble baryta-salts. They are, in fact, not acids, but *acid salts*. The most common example is *sulphovinic acid*, $C_2H_5 \cdot HSO_4$, now called ethyl hydrogen sulphate. As its formula shows, it is comparable to acid sodium sulphate, $NaHSO_4$, the Na being replaced by the radical ethyl.

VINLAND—i.e., WINELAND—the name given to the chief settlement of the early Norwegians in North America. It is undoubtedly represented in modern times by part of Massachusetts and Rhode Island. The first that saw it was Bjarne Herjulfson, who was driven thither by a storm in the summer of 986 A.D., when making a voyage from Iceland to Greenland, of which country his father, Herjulf, and Eric the Red were the earliest colonists. But Bjarne did not touch the land, which was first visited by Leif the Lucky, a son of Eric the Red, about 1000 A.D. The latter built a number of wooden houses, which were called *Leifsbúdir* (Leif's bothies?). A German of the name of Tyrker, who accompanied him, noticed the grape growing there, as in his native country, and hence Leif called the region "Vinland." Two years after, Leif's brother, Thorwald, arrived, and in the summer of 1003 led an expedition along the coast of New England, southward, but was killed the year following in an encounter with the natives. The most famous of the Norwegian explorers, however, was Thorfinn Karlsefne, an Icelander, who had married Gudrid, widow of Thorstein, a son of Eric the Red, and who in 1007, sailed from Greenland to Vinland with a crew of 160 men, where he remained for three years, and then returned, after which no further attempts at colonization were made. Rafn (q.v.), in his *Antiquitates Americanæ*, has published the most complete collection of the evidence which proves the pre-Columbian colonization of America. See Wilhelmi's *Island, Heitramannaland, Grönland und Vinland* (Heidelberg, 1842). Both Rafn and Finn Magnusen are excessively anxious to show that Columbus derived his first hints of a new world from the accounts of these old Icelandic expeditions. Their *amor patriæ* perhaps leads them too far; but, on the other hand, it is well to bear in mind that Finn Magnusen, in one of the early numbers of the *Nordisk Tidsskrift for Oldkyndighed* has conclusively established the fact that Columbus did visit Iceland in 1477, 15 years before he undertook his great expedition across the Atlantic; and it is not at all improbable that he may have heard, while there, something of the long-abandoned Vinland. See Nordenskiöld in *Nature*, vol. xxviii.

VINNITZA, a t. of west Russia, in the province of Podolia, stands on both banks of the Bug, 100 m. e.n.e. of Kaminetz. It was founded in the 14th c., and has suffered much from the invasions of Tartars and the Cossacks. There were, in 1891, 13 factories,

5 Russian, and one Catholic church, and 13 synagogues. Pop. '91, 24,989, of whom 58% were Jews.

VINTON, a co. in s. Ohio, drained by Raccoon and Salt creeks; 402 sq.m.; pop. '90, 16,045. Co. seat, McArthur.

VINTON, Alexander Hamilton, d.d., 1807–81; b. Providence, R. I.; studied at Brown university; graduated at the Yale medical school, 1828; practiced medicine, 1828–32; studied theology at the General Episcopal seminary, New York; ordained, 1835; pastor of a church, Portland, Me., 1835–36; at Providence, R. I., 1836–42; at Boston, 1842–58; rector of Holy Trinity, Philadelphia, 1858–61; rector of St. Mark's church, New York, 1861–70; rector of Emanuel church, Boston, 1870; professor in the Protestant Episcopal divinity school, Cambridge, Mass. Dr. Vinton was an eloquent pulpit orator, a ripe scholar, and a faithful minister.

VINTON, David H., 1803–73; b. R. I.; graduated at West Point, 1822; entered 4th artillery; was sent to Florida, 1836; quartermaster-general of Florida, 1837–46; chief quartermaster on the staff of Gen. Wool in Mexico, with rank of major, 1846; chief quartermaster in department of the west, 1852–56; of Texas, 1857–61; taken prisoner when Twiggs surrendered; exchanged, and became chief quartermaster, New York; made colonel, 1864; assistant quartermaster-general, 1866; placed on retired list the same year; was brevetted colonel and brigadier-general for faithful service.

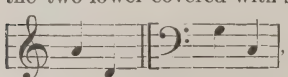
VINTON, Francis, d.d., 1809–72; b. R. I.; graduated West Point, 1830; second lieutenant 3d artillery; stationed at fort Independence, Boston; studied law at Harvard law school; civil engineer on several New England railroads two or three years; admitted to the bar, 1834; studied theology at the Episcopal theological seminary, New York, 1836; ordained 1838; rector at Providence and Newport, 1840–44; Grace church, Brooklyn, N. Y., 1844–55; assistant minister of Trinity church, New York, 1855; prof. of ecclesiastical law and polity in the General theological seminary, 1869. He published *Arthur Tremaine*, or *Cadet Life; Manual Commentary on the General Canon Law of the Protestant Episcopal Church in the United States.*

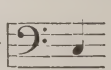
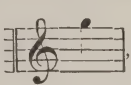
VINTON, Francis Laurens, b. Maine, 1835; graduated West Point, 1856; entered the cavalry, but resigned, to devote himself to metallurgy; became pupil of the Imperial School of Mines at Paris, graduating with distinction; appointed capt. of the 16th U. S. infantry, 1861; col. 43d regiment of N. Y. volunteers; fought in Hancock's brigade through the peninsular campaign; made brig.gen. of volunteers, Mar. 1, 1863; wounded at Fredericksburg; prof. of mining engineering, Columbia college, 1864. D. 1879.

VINTON, Justus Hatch, 1806–58; b. Conn.; educated at Hamilton institution, (now Colgate university); sailed as missionary of the American Baptist missionary union for Burmah in 1834; was stationed among the Karens at Chummerah, 90 m. from Moulmein; visited the United States in 1851, and returning took charge of the Karen theological seminary at Moulmein, but removed the following year to Rangoon, continuing his labors among the Karens.

VIOL (Mid. Lat. *vitula;* Ital. *viola*, derivation uncertain), a musical instrument played with a bow, no longer in use, which was the immediate precursor of the violin. It is to be seen represented on monuments as far back as the close of the 11th century. The belly and back were flat; there were larger bends in the sides than in the violin; and frets, like those of the guitar, were placed on the neck of the instrument, to show where the fingers of the left hand should be put to produce the desired notes. There was great variety in the number of strings: in Germany, 3, 4, and 5 were all common; in Italy, there were usually six. The strings were tuned by fourths and thirds. There were 4 sizes of viol in use for treble, alto, tenor, and bass respectively, and they were often played together in concerted music. The smaller viols were called *viol da braccio*, from being held with the arm; the larger, *viol da gamba*, from being placed between the legs. The treble viol was rather larger than the modern violin. The viol da gamba, or bass viol, held its place longer than the smaller viols, but was eventually superseded by the violoncello.

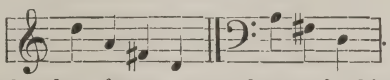
VIO'LA, Alto Viola, or Tenor Violin, a larger description of violin, to which the part between the second violin and bass is generally assigned. It has 4 gut strings, the two lower covered with silvered copper wire. They are tuned by fifths, thus,



, exactly an octave above the violoncello. The compass is from  to  , or higher, and the music is generally written on the alto clef.

VIO'LA D'AMO'RE, an obsolete instrument of the viol tribe, revived a few years ago with some success by M. Urhan at Paris. It had 5 or 7 strings of catgut, which were placed and played as in other bow-instruments; but below them, and passing underneath

the bridge, were 5 or 7 other strings of metal tuned in unison with them, which vibrated sympathetically when the former were played; giving to the music a mysterious resonant character. The compass was at least three octaves and a half. The strings of M. Urhan's viola d'amore were tuned in thirds and fourths, thus:



VIOLA'CEÆ, a natural order of exogenous plants, of which about 300 species are known, natives both of temperate and tropical countries, those belonging to the former being generally herbaceous, and those belonging to the latter generally shrubby. They have simple leaves with persistent stipules. The calyx consists of five persistent sepals, usually elongated at the base; the corolla of five hypogynous petals, unequal in the sub-order *violeæ*, and equal in the sub-order *alsodeæ*. There are five stamens inserted in a hypogynous disk; the filaments prolonged beyond the anthers. The ovary is one-celled, generally with many ovules, the style single, with an oblique stigma. The fruit is a three-valved capsule, with many seeds. The best known species are the violets (q.v.), noted for their beauty and fragrance. Emetic and purgative properties prevail in the order, and some of the South American species, particularly of the genus *ionidium*, yield valuable medicines. See IPECACUANHA and CUICHUNCHULLI. Yet the leaves of the lobolobo (*conohoria* or *alsodeia lobolobo*) are used in Brazil as spinach.

VIOLENT PROFITS, in the law of Scotland, mean the income or rent enjoyed by one who forcibly or unwarrantably detains land to which he has no title. Such profits are held to be the full profits which the landlord could have made either by possessing the lands himself or by letting them.

VIOLET (*Viŏla*), a genus of herbaceous plants, mostly perennial, of the natural order *violaceæ*. They have a short stem, or are stemless, having in the latter case a short root-stock (rhizome); the leaves are alternate, and have long stalks; the flowers have five petals, different in form and size, the lowest having a spur behind. Nearly 200 species have been described, natives chiefly of northern temperate countries. Several species are much cultivated in gardens, some as *V. tricolor*, on account of their beautiful flowers; others, as *V. odorata*, on account of their fragrance. *V. tricolor*, the PANSY, PANSY VIOLET, HEART'S EASE, is very abundant in fields, meadows, woods, etc., in Britain and in most parts of Europe, and the n. of Asia; it is also found in North America, although it has probably been introduced here from the old world. It is a very variable plant, its flowers differing much in size and color, but is readily distinguished by its large lyrato pinnatifid stipules. The stem is somewhat triangular, branching, and diffused. In some of its most common forms, this plant is a mere despised weed, with small flowers: other wild forms have much larger flowers; and to it are referred the large and beautiful garden pansies, the varieties of which are innumerable. The pansy (Fr. *pensée*, probably from the drooping attitude of the flower, suggestive of thoughtfulness) is one of the finest of florists' flowers, and no flower has been more improved by cultivation. Another species has of late years been introduced into cultivation, *V. altaica*, a native of Siberia, and by itself, or by hybridization with *V. tricolor*, has become the parent of many garden pansies. In a wild state, it has oval leaves, and large yellow or purple flowers. The finest garden pansies are not preserved or propagated without great difficulty, and require most careful cultivation, without which they quickly relapse to their wild forms. Florists demand that a pansy shall have a round, flat, and very smooth edge, the petals thick and velvety, the three lower petals alike in their ground color, the lines or pencilings in the center bright and distinct, the two upper petals—which always differ in color from the others—perfectly uniform, the flower measuring at least an inch and a half across.—The SWEET-SCENTED VIOLET (*V. odorata*) is common in grassy places in England, and throughout Europe and the n. of Asia. The flowers are either of a deep blue color or more rarely white. Several other species, with pale blue flowers, and destitute of smell, are common in meadows and woody glades in Britain and other parts of Europe.—The DOG VIOLET (*V. canina*) is one of the most common ornaments of hedgebanks.—North America has a number of species, one of which, *V. blanda*, is sweet-scented. The Himalayas produce a number of species very similar to those of Europe. The roots of several species of violet were formerly used in medicine. They contain a bitter alkaloid, *violine*, which acts as an emetic and purgative. The petals of the sweet-scented violet are used for the preparation of *juice or syrup of violets*, which is used as a gentle purgative for children, and also as a chemical test, being reddened by acids, and rendered green by alkalies. The bruised leaves of *V. tricolor* are sometimes used as a remedy for ringworm.—The DOG'S TOOTH VIOLET (*erythronium dens canis*) has no connection with this genus, but is a very beautiful flower of the natural order *liliaceæ*.

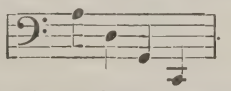
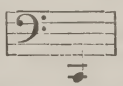
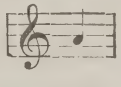
VIOLET STONES, the name given to certain stones found upon high mountains, as in Thuringia, upon the Harz mountains and the Riesengebirge, which, in consequence of being covered with what is called *violet moss*, emit a smell like that of violets. They retain this smell for a long time, and it is increased by moistening them.—The VIOLET MOSS (*byssus iolithus*), which some botanists have been inclined to rank with lichens, and others with fungi, consists of simple articulated threads, and spreads over the stones in

the form of a delicate incrustation, which at first is reddish brown, but in a more advanced stage, yellowish green. It was formerly in use as a popular remedy for feverish cutaneous eruptions.

VIOLIN, the most popular of stringed instruments played with the bow. Its primitive form developed out of the lyre and monochord, the strings from the former, and the principal parts, the elongated resonant-box with its sound holes, finger-board, and movable bridge from the latter. The true history of the violin begins with the invention of the bow, which was first applied to the Crwth (q.v.), some time before the 13th century, when the viole, or vielle, of the Troubadours made its appearance. The rebec, the geige, the fidel, and many kinds of viols and violas underwent various changes until towards the middle of the 16th century the true violin model appeared, and drove all other instruments of the same class away, except the viola, the violoncello, and the double bass. The primitive fiddles had no contour, and it was not until the 13th century that the body of the vielle was scooped out at the ribs, forming a kind of waist. The corner-blocks were added about the 15th century, and it is supposed they originated in Germany. The foundation on which violin-making was to rest was the viol with the double-corners. These produced a new constructive feature, the "bouts," the ribs which curve inward between the two corner-blocks. These "bouts" rendered it possible for the first time for a player to get at the strings. At first they were made of enormous size and were tapered down at a later date. For nearly a century the sound-holes were shifted all over the violin, sometimes crowding with the bridge near the tail-piece. It was not for some time after the violin model had been in that they were cut in their proper place and the bridge fixed between them. The bridge was the last point perfected, and by Stradivarius. The violin, as we have it, is about three centuries old. Violins may be divided into two classes, those made on the high and those on the flat model. The former is characteristic of the Stainer pattern, the latter of Stradivarius. The violin, viola, and violoncello are identical in construction except as regards size. The violin consists of seventy different parts, all of which, except the strings and loop, are made of wood. These are: back, two pieces, sometimes one; belly, two pieces, sometimes one; six blocks; six ribs; twelve linings; one bar; twenty-four pieces of purfling, the narrow border outlining the form of the instrument; the nut, fingerboard, neck and lower nut. The movable fittings are the tail-piece, loop, button, or tail-pin, four screws, four strings, sound post, and bridge. The wood chosen is of three kinds: maple for the back, neck, ribs, and bridge; ebony for the finger-board, nuts, screws, tail-piece, and button; and pine for the belly, bar, blocks, and linings. The purfling is made partly of ebony and partly of maple. Some makers use whalebone as the more pliable. Next to cutting the scroll, purfling is the most difficult part of violin-making. A groove is cut around the edges of the instrument for its insertion, and much art is required to bend it into shape before it is laid in its place. The outline is first traced on a plate of hard wood, from which a pattern is cut. This serves for the back and belly. The mold is next made from a block of hard wood, spaces are cut in it for the blocks, the edges trimmed, and finger-holes pierced so that the pattern may be manipulated. The back is the first part made. It is shaped and hollowed out of a block and brought to the right curves by means of four templates of different sizes, cut to curves the reverse of those intended for the surface of the instrument. The top and bottom blocks are prepared and shaped. Strips of maple are prepared for the ribs, being dipped in water and bent to the curves by a hot iron. These are glued to the blocks, which are placed one in each bout, and at the top and bottom of the instrument. The entire form is then screwed in a frame and left to dry. When this is removed the back is glued on to the ribs, and filled with linings of pine passing from block to block and dovetailed at each end. After the bass bar has been placed under the left side of the belly, this is glued to the other side of the ribs. The head and scroll are then carved, the neck, tail-piece, and small fittings adjusted, and the instrument is ready for its various coats of varnish. The most celebrated violins are those of the Cremona and the Brescian makers. The former are unrivaled. Their reputation is mainly due to the brothers Amati (q.v.), who developed the model to which Joseph Guarnerius (q.v.) and Stradivarius (q.v.) added power and tone. The latter carried the violin to its perfection in design and capacity. The Brescian makers worked from about 1580 to 1640, and include Gaspard di Salo and Maggini, whose characteristics are shared by Andreas Amati, the earliest maker of Cremona. The violin makers of South Germany form a distinct school. The most noted of them are Stainer and Klotz. The best French makers are Vuillaume (q.v.) and Lupot; the English, Furber and Hills. Violin-playing dates from about the 16th century, and the first form of composition was the violin sonata, which originated in Italy. The most eminent early composer for the violin was Corelli (1653–1713), who marks an era in violin-playing. His works were models for his successors. After him stands Tartini, the next greatest representative of the violin school. Tartini makes great advance in the use of the bow. Haydn's and Mozart's chamber music aided much in giving the violin importance. As teachers in the newly founded Conservatoire of Paris, Rode, Kreutzer, and Baillot laid down principles in violin-playing, which are maintained to-day. The style of the Paris school was taken to Germany by Viotti and Rode, who bequeathed their place to Spohr, one of the greatest influences in violin-playing. Paganini caused a revolution in technique, which affected all

schools, though he founded none. The most striking representatives of the modern French school are de Bériot (1802–1870), and Vieuxtemps (1820–1881). Habeneck, Sainton, Prume, Alard, Leónard, Massart, Sarasate, Wienawski, and Teresina Tua belong to this school. In Germany the schools of Leipsic, Cassel, and Vienna are the most important. Ferdinand David, Spohr's pupil (1810–1873), the founder of the Leipsic school, has been the greatest factor. The most eminent of his pupils is August Wilhelmj (1845), whose broad tone and wonderful technique make him second only to Joachim. Through Joseph Boehm the Vienna School attained renown. Its representatives are Joachim, Jakob Dont, Jansa, and Mme. Normann-Néruda. Ole Bull (1810–1880), the Northern Paganini, belonged to no school and left no influence in violin-playing. See Rühlmann, *Geschichte der Bogen-Instrumente* (Brunswick, 1882); George Dubourg, *The Violin* (London, 1852); Sandys and Foster, *History of the Violin* (London, 1864); Hart, *The Violin and its Music* (1881); and Vidal, *Les instruments d l'archet* (3 vols., Paris, 1876–'8).

VIOLLET-LE-DUC, Eugène Emmanuel, b. Paris, 1814; studied architecture and became proficient in designs of the Gothic style. His reputation in his profession is very high, and he was specially skilled in the restoration of churches. Perhaps his best work in this direction is the restoration of Sainte Chapelle. The changes in Notre Dame, Paris, were the joint work of M. Viollet-le-Duc and M. Lassus. He was a grand officer of the Legion of honor and an honorary member of the Royal academy, London. He produced several books on architecture, which have been translated into English, and a *Memoire sur la Defense de Paris* (1871). He d. 1879.

VIOLONCELLO (diminutive from Ital. *violone*, large viol or double-bass), a large instrument of the violin class, held by the performer between his knees. It has four gut strings, the lowest of them covered with silvered copper wire, and is tuned thus, in fifths:  . Its compass extends from  to 

Its signature is usually the bass clef, the tenor or treble clef being used for the higher notes.

VIOMÉNIL, Antoine Charles du Houx, Vicomte de, 1728–1792; b. France, entered the army in which he attained the rank of field marshal. He assisted the Polish confederation against Russia in 1770. Coming to America in 1780 as Rochambeau's second in command, he gained distinction at the siege of Yorktown, and was soon made lieut. gen. After his return to France, he became governor of La Rochelle. He died from wounds received in defending Louis XVI. in the assault upon the Tuileries.

VIOTTI, Giovanni Battista, an eminent violin-player; b. at Fontanetto in Piedmont, in 1753, and chiefly educated under Pugnani at Turin. After holding for a short time the appointment of first violinist in the royal chapel at Turin, he relinquished that office, in order to travel in Europe with Pugnani. In Berlin, St. Petersburg, Paris, and London, his playing created a *furore*. He first visited London in 1792, and was engaged there at Salomon's concerts, and for a time as leader of the orchestra in the king's theater. A groundless charge raised against him of being a revolutionary agent drove him from England; but after living for a time in retirement at Hamburg, he returned to London, entered into speculations which ruined his fortunes, and died there in 1824. His compositions include violin concerts and quartetts for violin, tenor, and violoncello, violin duets and solos, and a few piano-forte compositions. His playing was characterized by a vigor of style and purity, as well as brilliancy and elegance, previously unknown; and he has been considered the father of the modern violin school.

VIPER (*Vipera*), a name common to the members of the family *Viperidæ* (q.v. for the characters common to all the vipers). The only V. found in Britain is the Common V. or Adder (*Pelias berus*), found throughout Europe from the north of Russia to the Mediterranean, and in many parts of England and Scotland, but not in Ireland. The latter seldom attains a length of much more than two feet. The head is depressed, widening between the eyes, the gape as long as the head. Like the rest of the family, it has a pair of mobile fangs in the upper jaw. The neck is smaller than the back of the head. From the neck, the thickness increases to near the middle of the entire length, and then diminishes to the vent. The tail tapers rapidly to a point. It is one of the few vipers having head shields. It has two diverging marks between and rather behind the eyes, a spot on each side of the hinder part of the head, a row of confluent rhomboidal spots running zigzag along the upper surface, the whole length of the body and tail, and a row of small, irregular, almost black, triangular spots on each side. The under parts are of a lead color. The characteristic markings are almost invariable; but the ground color varies considerably, from nearly olive, rich deep brown, or brownish yellow, to almost black. Thus, in some parts of England, a Black V. is occassionally met with; its ground color a rich black, and the markings of a more intense black than the rest. There is also the "red" or the "blue bellied," or an almost white viper, with black markings; diversities which have led some naturalists too hastily to describe the snakes

to which they belong as distinct species, but *Pelias berus* is the only venomous serpent found in Britain. See illus. Reptiles, vol. XII.

The name V.(Lat. *Vipera*) is manifestly a contraction of *Vivipera* for *Vivipara*. The name Adder arose from writing *an adder*, for *a nadder*. The A. S. is nædre, Old Eng. *naddere, neddere*, or *addere;* Scot. *nether*. It is unconnected with *attor*, poison. Pliny, Galen, and other ancient writers ascribe great medicinal value to broth made of vipers, and to the flesh of the animal. Vipers entwined together, in hybernation were supposed to produce the *Ovum Anguinum*, to which virtues were attributed; and *snakestones* as charms were at one time common in Britain. They were either marbles, or glass beads of various forms, supposed to cure vipers' bites, and to be otherwise useful.

VIPERIDÆ, a family of snakes, that, with a second family, *Crotalidæ*, (q.v.), constitutes *Viperina*, the third sub-order of *Ophidia*. The general viperine characteristics are the wide angular, depressed head, causing the neck to appear small in comparison; a short thick body; and a tail tapering suddenly to a point. In some of the largest vipers the short, unmistakeable tail is only two inches in length. The head is mostly covered with scales, rarely plates, or only a few about the eyes and lips, or with extremely fine plates. The scales are carinated, often rough, even spinous. The ventral shields are broad, and the sub-caudal plates in two rows. The nostrils are large and in some species they close with a valve. This highly venomous family of serpents are furnished with a pair of long, curved fangs. In this order, the upper maxillary, bearing two isolated fangs fixed to it, is reduced to a mere wedge of bone, which is movably articulated, and by especial muscles rotates or rocks to and fro, and the fang with it. The action is volitional as a whole. The viperine snakes are often said to have "movable fangs," though the fangs themselves do not move independently, but only with the bone to which they are attached. Thus, when at rest, the fang, protected by a membranous sheath, lies supine along the jaw; but when in use springs down by the rotation of the maxillary bone, just as a scythe might point downwards or horizontally by the movement of the handle. The fang has a canal in its interior, connected with a poison gland, the contents of which are ejected into the wound made by the fang in the act of biting. Behind the pair of functional fangs, others, in a rudimentary stage, are found, and may even create a wound, though, being as yet unconnected with the poison duct, they do not convey venom into the wound. The lower jaw has numerous solid teeth of the ordinary form. Formerly, the vipers were confounded with colubrine snakes; and even at the present day the authorities differ in the arrangement of *genera* and *species*, on account of the forms running so much into each other. Dumeril gives six genera and seventeen species; Wallace, three genera and twenty-two species; and Gray, nine genera and twenty species. Those of the family best known are the "River Jack" of West Africa, the Horned Viper or Cerastes (q.v.) of Northern Africa and the west coast of Asia, the Carpet Snake of India. The V., as above mentioned, are for the most part distinguished by their broad, flat, angular head; thick, heavy body; short, tapering tail; rough carinated scales; and a generally hideous physiognomy which seems to express their noxious qualities. Nevertheless, some of them possesss a handsome exterior, and are adorned with dark rich colorings and patterns. The *Daboia* of India is one of these, and being of a less clumsy form, has been named *Vipera elegans*. The true vipers, or those which have not the nasal fosse, are most largely represented in Africa, which has about twelve species. Europe has three; India two; and South America only one very small but intensely poisonous species, the Peruvian adder (*Echidna ocellata*), not much known. The anomalous Death Adder (*Acanthophis antarctica*) of North Australia, with its unmistakably venomous look, is included among the vipers; notwithstanding it has a pair of *fixed* fangs like the *Elapidæ*. The largest and deadliest species are found in tropical countries. They inhabit dry sandy deserts, and are of a retiring, sluggish nature. See Lachesis, Asp, Puff Adder, Rattle Snake, etc.

VIPER'S BU'GLOSS, *Echium*, a genus of plants of the natural order *boragineæ*, having a calyx with five deep segments, an almost bell-shaped corolla, with dilated throat, and irregular limb, very long unequal filaments, and a bifid style. The species are large herbaceous plants or shrubs, rough with tubercles and hairs. Their flowers are often very beautiful. The Common Viper Bugloss (*E. vulgare*), a large annual plant, is a native of Britain and of most parts of Europe, growing in dry places, not unfrequently in corn-fields. Its flowers are at first reddish, and afterward blue. It derives its name, viper bugloss, from spots on its stem, which somewhat resemble those of the viper; and the property of healing vipers' bites was, therefore, ascribed to it. Other herbaceous species are found in the s. of Europe, North and South America, and other parts of the world. Shrubby species are found chiefly in the Canary islands and in s. Africa.

VIRCHOW, Rudolf, pathologist and publicist, was b. at Schivelbein, Prussia, Oct. 13, 1821. He was a pupil of the great physiologist, Johann Müller; graduated in medicine in 1843; and became, in 1847, lecturer at the university of Berlin. Soon afterward he was commissioned by the government to investigate the cause and cure of typhus in Silesia; and also, in conjunction with Reinhardt, founded the annals of pathological anatomy and of clinical medicine. The political commotions of 1848 dragged him, in common with many other votaries of science, into the revolutionary vortex. He established a journal entitled the *Medical Reformer*, and also a democratic club, where he soon dis-

tinguished himself as an orator. He was, in consequence, elected a member of the national assembly, but was not admitted because he was, in a parliamentary sense, a minor. With the conservative reaction, Virchow had his journal suppressed, and lost his post, but was elected to the chair of pathological anatomy in Würzburg. His lectures at that university were widely popular for the novel views which he struck out particularly in cellular pathology. His reputation grew so great that he was recalled by Manteuffel in 1856 to Berlin, where he re-occupied the chair of pathological anatomy, and rendered it the most famous of its kind in Europe. In 1859, when the liberal cause revived, he became a member of the municipal council of Berlin, where he distinguished himself as a reformer of the arbitrary police system then rampant; and soon after was chosen deputy by the electoral college of Saarbrück, and by two of the Berlin colleges. He soon rose to the leadership of the opposition, and proved a most effective antagonist of the encroachments made in the name of the royal prerogative. He took the lead, in Jan., 1863, in carrying the address in which the ministry were accused of having violated the constitution. Such was the energy of his opposition, that in June, 1865, he was challenged to a duel by count Bismarck. In 1878 he retired from parliamentary life, in order to devote himself exclusively to science, after having been for years a prominent member of the advanced liberals in the Reichstag. Among his works are his inaugural thesis, *De Rheumate Corneæ* (1843); *The Colloid Tumours of the Ovaries, and on Cancer* (1847); *Cholera* (1848–49); *Flexions of the Uterus, Scrofula, Tuberculosis, Typhoid Fever* (1850); *Cellular Pathology* (1850); *Amyloid Degeneration* (1853); *Morbus Spedalska* (a disease peculiar to the Norwegian coasts, 1859); *Trichiniasis* (1860); *Tumours* (1862); *Cellular Pathology in its foundation on Physiological and Pathological Histology* (1871); a notable article *On the Standpoints of Scientific Medicine* (1878). During the wars of 1866 and 1870–71, Virchow took an active interest in the sanitary arrangements for the troops in the field. In 1892 he was elected rector of the university of Berlin; in 1894, received the grand cross of the order of Sts. Maurice and Lazarus from the king of Italy; and in 1896 was appointed a commander of the legion of honor by the French government.

VIRE, a t. of Normandy, France, in the department of Calvados, picturesquely situated on a hill washed by the Vire, 35 m. s.w. of Caen. It is an important center for wooden manufactures and carries on a trade in granite quarried in the neighborhood.—*Vaux de Vire* (see VAUDEVILLE). Pop. '91, 6363.

VIREO, or GREENLET, the common name of a family of insectivorous birds, having a plumage more or less tinted with green and olive. In the genus vireo the bill is short and strong, nearly straight, notched and hooked at the tip. The wings are long and pointed; toes of moderate length; tail moderate and even. There are about 20 species, migrating from South America and the West Indies to the United States, arriving there in May, breeding during the summer, generally having two broods in a season, and returning in the autumn. Many of these beautiful birds are very sweet singers, and destroy a great many insects. The nest is made in trees and bushes of dried leaves, moss, grass, etc. The red-eyed vireo, *V. olivaceus,* is about 6 in. long, and a little over 10 in alar breadth. The tail is a bright olive-green above; top of the crown ashy, and white below. The iris is red. Its range is from eastern United States to Missouri, and from Greenland to Central America. A more southern species is *V. barbatulus,* or Whip-Tom-Kelly. The solitary vireo, *V. solitarius* of Baird, about 5½ in. long, and 9½ in alar extent, is found in the United States from the Atlantic to the Pacific. Upper parts dark olive-green; white rings around the eyes, two bands on the wings, and edge of secondary feathers white; greenish-yellow under the wings.

VIRGIL, the Magician, is the character in which the great Roman poet presented himself to the popular imagination of the Middle Ages. The origin of this singular delusion may be thus explained. From a very early period—almost, we may say, from the age in which he flourished—Virgil was acknowledged to be the prince of Latin poets. His poems threw all others into the shade, and this, not so much because they exhibited a finer and more original genius, as because their style was perfect, the subject of his *magnum opus* thoroughly national, and his immense historical and antiquarian lore devoted to the glorification of the Roman people. From him the grammarians selected the examples of their rules, and even composed treatises on special questions suggested by his poems. The rhetoricians, too, found there material for their themes and declamations, and the later poets imitated his phraseology. Very soon the idea sprung up that in his verses there lay hidden quite a peculiar wisdom and mystic meaning. Thus it happened that, as early as the 3d and 4th c., even Christian authors (e.g., Minutius Felix, Lactantius, and Augustine) had contracted the habit of regarding him reverentially, a feeling which, in its turn, induced them to use him for polemical, or at least theological purposes. Hence they sought to prove the beginning of the fourth eclogue a Messianic prediction, and would have it that Virgil foresaw the day of Christ. This view rooted itself so deeply, that Virgil and the Sibyl (q.v.) were actually introduced into the liturgy of the church, along with the Messianic prophecies of the Old Testament, and in the "mysteries" of the Middle Ages, are frequently cited as bearing witness to a coming Messiah. Furthermore, when the first ages of polemical theology arrived, biblical critics and controversialists did not hesitate to quote the verses of Virgil in elucidation of passages of Scripture, and in confirmation of their views. Later still, some of the scholastics endeavored to give a "moral" significance to the whole *Æneid;*

and an epitome of sacred history even was manufactured out of its contents (see CENTO). Another use, or rather *mis-use* of the verse of Virgil had already begun during the Roman empire, and affords additional evidence of the superstitious reverence that was gradually encircling the name of the poet: we allude to the custom of trying to discover one's fortune by selecting lines at random from his epic. See SORTES BIBLICÆ, SORTES VIRGILIANÆ. Ultimately, as may be seen from the *Divina Commedia* of Dante, Virgil came to be considered as a representative of pure enlightened reason; a highly-gifted genius standing midway between paganism and Christianity.

We have remarked that this deep, half-religious veneration for Virgil displayed itself at a very early period. Soon after his death, statues were erected to his memory, even in the domestic chapels of the emperors; the anniversary of his birth was held sacred; pregnant women and poets made pilgrimages to his tomb, and hence it became inevitable that all sorts of myths should spring up and attach themselves to his history; but the predominant conception in the middle ages was that of a wise, pure, and patriotic teacher, endowed with magic power and lore—quite a different kind of being from the evilly disposed and dreaded "sorcerer" of popular fancy. The Virgilian myths established themselves more especially in connection with the places where he was born, where he chiefly lived, and where he died—Mantua, Rome, and Naples; and there they even yet survive, in some measure, on the lips of the people. But, curiously enough, it was not from the Italians, but foreigners, that they first obtained literary consideration. The oldest document bearing on the subject, of which we have any knowledge, is the *Otia Imperialia* of the Englishman, Gervase of Tilbury, who collected his stories from the mouths of the Neapolitan populace. A fuller account is to be found in the *Chronicle* of Arnold of Lübeck, who got his information from Conrad, bishop of Hildesheim, chancellor of the emperor Henry VI. These were followed by their contemporaries, Helinandus, whose legendary history of Virgil is embodied in the 6th book of Vincentius Bellovacensis' *Speculum Historiale*, and the English monk, Alexander Neckam, in his *De Naturis Rerum*, the best parts of which (relating to Virgil) are preserved in the repeatedly published *Vitæ Philosophorum* of Gualterus Burlæus. From these four main sources the later Virgilian myth-mongers have chiefly borrowed; of whom the two chiefly deserving notice are Buonamente Aliprando (author of a chronicle of Mantua in *terza rima*, about the beginning of the 15th c.), and the so-called Pseudo-Villani (author of *Le Croniche dell' inclita città di Napoli* (Naples, 1526). Particular stories and allusions are found pretty thickly scattered through the whole literature of the middle ages after the 13th century. The first complete collection, however, of the Virgilian myths was the French "people's book," entitled *Faictz Marueilleux de Virgille*, published in the beginning of the 16th c., by Jehan Trepperel at Paris, translations of which soon after appeared in Dutch and English. Even the distant Icelanders had heard of the great magician, and there still exists in MS. an Icelandic *Virgilius-Saga*. The greater part of the Virgilian myths collected in the "people's books" are of various ages and origin, and have come down to us in different forms. Some have decidedly been shaped after eastern models, but the majority are of Latin and Italian growth.—See Zappert. *Virgil's Fortleben im Mittelalter* (Vienna, 1851); Siebenhaar, *De Fabulis* (Berl. 1837); Edélestand du Méril, in his *Mélanges Archéologiques et Littéraires* (1850). Milberg, *Memorabilia Vergiliana* (1867); Comparetti, *Virgilio nel Medio Ævo* (1872); and Tunison, *Virgil in the Middle Age* (1889).

VIRGIL'IA, a genus of leguminous trees, natives of s. Africa. Michaux referred to this, one of the finest North American trees, the yellow-wood, and called it *virgilia lutea*, but from differences in the pods and other parts, Rafinesque made a new genus for it, and called it *cladrastis tinctoria*, which is its present botanical name. The name of virgilia is, however, commonly applied to it. It grows to a height of 30 or 40 ft. and a diameter of about one foot. It has long compound leaves, with from seven to eleven leaflets, the base of the petiole being expanded to cover the bud of the following year. The flowers are in loose, pendent racemes from 10 to 20 in. long, of a pure white, except a small yellow spot in the center of each. They have the appearance of *papilonaceæ*, but their distinct stamens and other characteristics place them among the *sphoreæ*. The pod is from 3 to 4 in. long, narrow, flat, and four to six seeded. The tree is hardy in the latitude of Boston, and it is easily raised from the seeds. It is a fine garden tree.

VIRGIL'IUS (or, as it is more accurately spelled, VERGILIUS) **MA'RO**, PUBLIUS, after Homer, the greatest epic poet of antiquity, was born in the consulship of Crassus and Pompey, Oct. 15, 70, B.C., at Andes, a village not far from Mantua. It is probable that his father was the proprietor of a small estate which was farmed by himself. Virgilius was liberally educated, and is believed to have studied successively at Cremona and Mediolanum (Milan). In philosophy, he was instructed by Syron, an Epicurean, and one of his fellow-students was that Varus to whom his sixth eclogue is dedicated. Greek he learned at Neapolis (Naples) from the grammarian Parthenius. If we are correct in supposing that, in the first eclogue Virgilius relates his own experience in the person of Tityrus, he first visited Rome 41 B.C., in his 30th year, for the purpose of reclaiming his lands, which were occupied by the soldiery of Octavianus, at the close of the war against the republicans. At Rome, he was introduced to Octavianus, through the influence of Pollio, or of some other patron, and further formed the acquaintance of his great pro-

AREA AND POPULATION OF VIRGINIA BY COUNTIES.

(ELEVENTH CENSUS: 1890.)

	Area in Square Miles.	Population.		Area in Square Miles.	Population.
Accomac	500	27,277	Lee	429	18,216
Albemarle	675	32,379	Loudoun	520	23,274
Alexandria	32	18,597	Louisa	470	16,997
Alleghany	510	9,283	Lunenburg	429	11,372
Amelia	380	9,068	Madison	290	10,225
Amherst	490	17,551	Mathews	100	7,584
Appomattox	317	9,589	Mecklenburg	658	25,359
Augusta	950	37,005	Middlesex	135	7,458
Bath	735	4,587	Montgomery	422	17,742
Bedford	675	31,213	Nansemond	400	19,692
Bland	320	5,129	Nelson	375	15,336
Botetourt	548	14,854	New Kent	210	5,511
Brunswick	600	17,245	Norfolk	476	77,038
Buchanan	450	5,867	Northampton	290	10,313
Buckingham	628	14,383	Northumberland	180	7,885
Campbell	465	41,087	Nottoway	281	11,582
Caroline	515	16,681	Orange	360	12,814
Carroll	450	15,497	Page	288	13,092
Charles City	200	5,066	Patrick	521	14,147
Charlotte	500	15,077	Petersburg City	...	22,680
Chesterfield	465	26,211	Pittsylvania	914	59,941
Clarke	255	8,071	Powhatan	255	6,791
Craig	381	3,835	Prince Edward	348	14,694
Culpeper	322	13,233	Prince George	268	7,872
Cumberland	290	9,482	Princess Anne	270	9,510
Dickenson	375	5,077	Prince William	357	9,805
Dinwiddie	529	13,515	Pulaski	345	12,790
Elizabeth City	50	16,168	Rappahannock	270	8,678
Essex	235	10,047	Richmond	210	7,146
Fairfax	420	16,655	Roanoke	321	30,101
Fauquier	680	22,590	Rockbridge	750	23,062
Floyd	444	14,405	Rockingham	883	31,299
Fluvanna	280	9,508	Russell	453	16,126
Franklin	750	24,985	Scott	528	21,694
Frederick	380	17,880	Shenandoah	495	19,671
Giles	446	9,090	Smyth	450	13,360
Gloucester	245	11 653	Southampton	567	20,078
Goochland	280	9,958	Spottsylvania	400	14,233
Grayson	485	14,394	Stafford	245	7,362
Greene	200	5,622	Surrey	298	8,256
Greensville	325	8,230	Sussex	420	11,100
Halifax	820	34,424	Tazewell	536	19,899
Hanover	450	17,402	Warren	234	8,280
Henrico	255	103,394	Warwick	165	6,650
Henry	410	18,208	Washington	622	29,020
Highland	389	5,352	Westmoreland	170	8,399
Isle of Wight	300	11,313	Wise	385	9,345
James City	140	5,643	Wythe	496	18,019
King and Queen	400	9,669	York	75	7,596
King George	190	6,641			
King William	270	9,605	Total	40,135	1,655,980
Lancaster	160	7,191			

VIRGINIA
AND
WEST VIRGINIA
SCALE OF MILES
0 10 20 30 40 50 60 70 80
County Towns
Railroads
Canals
WEST VIRGINIA
VIRGINIA
OHIO
KENTUCKY
TENNESSEE
NORTH
CHARLESTON
Longitude
West

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AREA AND POPULATION OF WEST VIRGINIA BY COUNTIES.

(ELEVENTH CENSUS: 1890.)

	Area in Square Miles.	Population.		Area in Square Miles.	Population.
Barbour	395	12,702	Mineral	370	12,085
Berkeley	320	18,702	Monongalia	325	15,705
Boone	515	6,885	Monroe	460	12,429
Braxton	565	13,928	Morgan	230	6,744
Brooke	84	6,660	Nicholas	720	9,309
Cabell	300	23,595	Ohio	120	41,557
Calhoun	260	8,155	Pendleton	650	8,711
Clay	325	4,659	Pleasants	150	7,539
Doddridge	475	12,183	Pocahontas	765	6,814
Fayette	750	20,542	Preston	709	20,355
Gilmer	330	9,746	Putnam	350	14,342
Grant	490	6,802	Raleigh	570	9,597
Greenbrier	1,050	18,034	Randolph	1,175	11,633
Hampshire	550	11,419	Ritchie	512	16,621
Hancock	92	6,414	Roane	470	15,303
Hardy	400	7,567	Summers	400	13,117
Harrison	464	21,919	Taylor	177	12,147
Jackson	470	19,021	Tucker	500	6,459
Jefferson	280	15,553	Tyler	330	11,962
Kanawha	825	42,756	Upshur	350	12,714
Lewis	400	15,895	Wayne	445	18,652
Lincoln	460	11,246	Webster	415	4,783
Logan	675	11,101	Wetzel	550	16,841
McDowell	680	7,300	Wirt	290	9,411
Marion	314	20,721	Wood	375	28,612
Marshall	248	20,735	Wyoming	660	6,247
Mason	440	22,863			
Mercer	420	16,002	Total	24,645	762,794

tector, Mæcenas. He continued to compose his eclogues—the tenth and last of which is dedicated to Gallus, and referred to the poet's 33d or 34th year. At the instance of Mæcenas, he commenced his *Georgics* in his 34th year, according to the grammarians, who also assign 7 years as the time he spent in the composition of the work, which was carried on principally at Naples. The *Æneid* was his last performance, and must have occupied many of the latter years of his life. He went in 19 B. C. to Greece, where he meant to subject his great poem to a thorough process of revision and refinement; and his voyage to Athens was made by Horace the occasion of the ode (book i. 3) commencing with "Sic te diva potens Cypri." At Athens, Virgilius met Augustus on his triumphal return from the east, and the poet was induced to go back to Rome in his company. He had only got as far as Megara, however, when he was seized with illness, which became worse on his voyage to Italy. On landing at Brundisium, or, according to another account, at Tarentum, he was unequal to the fatigue of traveling; and after lingering for a few days, he died, in the 52d year of his age, 19 B. C. In compliance with his dying wish, his body was removed to Naples, and buried at the second mile-stone from that city, on the Puteolan Way. Pliny the Elder and Aulus Gellius are among the writers who say that on his deathbed Virgilius desired his epic poem to be burned, rather than that it should see the light in its imperfect state; but that the injunctions of Augustus to his executors, or, according to others, the interposition of his friends Tucca and Varius, who persuaded him to bequeath it to them on the understanding that it should remain unaltered, were the means of preserving it. This incident is quite in keeping with all that we know of Virgilius's modesty of character. The liberality of his patrons had endowed him with considerable property. He had a house on the Esquiline, near the gardens of Mæcenas, where he lived with an elegant simplicity, while he allowed the public free access to his excellent library. He was tall of stature, dark of complexion, and had the appearance of a farmer. His most finished poem is the *Georgics*, in which the various departments of agricultural concern are described with great clearness, and illustrated by episodes of the finest poetry. His *Æneid* shows rather what he might have been than what he was as an epic poet. Unfinished as it is, however, its merits have always secured him a place in the front rank of epic writers; while, more than any similar work of antiquity, it has furnished a model to the epic and narrative poets of modern Italy. He has been edited and translated by scholars of nearly every country and period. The best English translation is that of the *Æneid* by William Morris (1875), which is on the whole superior to Dryden's, before unequaled. Conington's *Æneid* is in some features highly successful. The best editions are those of Heyne, Wagner, Forbiger, Ribbeck, and Conington. See the fine study of Virgil by Nettleship in his *Lectures and Essays* (1888); and by Sellar in his *Roman Poets of the Augustan Age* (1880).

VIRGINALS, a keyed instrument of former times. As described by Dr. Burney, it resembled in form a small pianoforte, with a compass of four octaves, furnished with a quill and jack like those of the spinet, and a single string to each note. Queen Elizabeth is said to have been a skillful performer on the virginals; but the instrument cannot, as popularly supposed, have been named in honor of the virgin queen, having been so called before her majesty's time.

VIRGINIA, a southern Atlantic state and one of the original 13, between lat. 36° 31′ and 39° 27′ n.; long. 75° 13′ and 83° 37′ w.; bounded on the n. by West Virginia and Maryland; on the e. by Maryland and the Atlantic ocean; on the s. by North Carolina and Tennessee; on the w. by Kentucky and West Virginia; greatest length from e. to w. about 475 m.; greatest width about 200 m.; gross area, 42,450 sq. m., or 27,168,000 acres; land surface, 40,125 sq. miles.

HISTORY.—V., popularly called the Old Dominion, whose shores were first explored by Sebastian Cabot, 1498, and again under the auspices of sir Walter Raleigh in the reign of queen Elizabeth, in whose honor it was named, was first settled by an English colony, under the charter of the London company, at Jamestown, on the James river, May 13, 1607—a colony consisting of gentlemen of fortune and persons of no occupation, no families, 12 laborers, and very few mechanics. The friendly Indians of the Powhatan tribe sold them land and provisions; but the diseases of a damp climate swept off half the settlers the first summer. The energy of Captain John Smith saved the colony from destruction, and in 1609 it was re-enforced with 500 persons, including 20 women and children, who were reduced by sickness and starvation to 60. They had embarked, to abandon the settlement, when lord Delaware came with emigrants and supplies. In 1610 a church was erected at Jamestown—the first permanent religious edifice erected by Englishmen in North America. The marriage of John Rolfe to Pocahontas (q. v.) in 1613 secured the friendship of the Indians. In 1619, 90 respectable young women were sent out from England, and each planter, on giving 120 lbs. of tobacco to repay the cost of her outfit and passage, was entitled to a wife. In addition 100 convicts were sent to supply labor, and a Dutch trader also sold the colonists 20 negroes. In 1619 Puritan emigrants arrived and continued to come, until it was estimated that nearly 1000 persons were of "similar mind;" but in 1643 laws were passed compelling conformity to the English church, and the Independents, as they styled themselves, were fined or imprisoned, and finally emigrated to Maryland and New England. In 1643 a public school was opened. Silk culture was undertaken; trade became brisk with England, Holland, and New England, and in 1649 the colony was increased by the arrival

of 300 royalist fugitives. In 1650 the Long Parliament prohibited trade with V., and in 1652 sent a fleet to receive the surrender of "the traitorous province;" but the burgesses yielded only on condition that their act should be acknowledged as voluntary, and in return received indemnity for acts and words against the parliament, were allowed free trade with all nations, also the sole right to tax V. In 1660 the house of burgesses declared that the supreme power of the government was to be resident in it, and that all writs should issue in its name. In 1622 the colony was reduced by wars and massacres from 4000 to 2500; but in 1624 it became a crown colony, and increased.

In 1671 the population was 40,000, including 2000 black slaves. The now prosperous colony consisted of 48 parishes, but had, Governor Sir William Berkeley thanked God, no free schools or printing, which he hoped they might keep free of for a hundred years, saying, "God keep us from both!" In 1754 the colonial militia took part in the French war, and Maj. George Washington was in Gen. Braddock's expedition. In 1764 the house of burgesses remonstrated against the attempt of parliament to tax the colonies without their consent, and in 1765 Patrick Henry introduced resolutions of similar import, which were adopted. In 1773 Patrick Henry, Thomas Jefferson, and Richard Henry Lee were appointed a committee to confer with the other colonies, and urged upon their delegates the declaration of independence. In 1774 the burgesses protested against the closing of the port of Boston, and called for a general congress of the colonies to inaugurate resistance, and in 1775 the colony began raising companies of volunteers. Lord Dunmore proclaimed martial law, and on Nov. 23 occupied Norfolk with a British and Tory force, but soon retired, and on Dec. 9 was defeated at Great Bridge by the V. volunteers. Returning in Jan., 1776, by sea, he bombarded Norfolk, and continued to ravage the coast, but was finally forced to retreat. In 1776, May 15, a convention of the colony instructed its delegates in congress to propose to that body to "declare the united colonies free and independent states." This declaration was written by Thomas Jefferson, a Virginian. A declaration of rights was adopted on June 15, and on June 12 a new constitution. In 1779 the British destroyed Norfolk and the shipping on the James and Elizabeth rivers, and took Portsmouth and Gosport, and in 1781 Richmond was burned by Benedict Arnold, and eastern V. was invaded by Cornwallis and Phillips. The revolutionary struggle ended on V. soil with the surrender of Cornwallis at Yorktown, Oct. 19. The federal constitution was ratified by V. June 25, 1788. During the first half of the present c. V. maintained her prominence in national affairs, and having been the birthplace of 7 of the presidents of the U. S., received the honorable title of "the mother of presidents."

In 1859 an attempt was made at Harper's Ferry by John Brown and other abolitionists to free the slaves. When the secession of the southern states from the union began to be considered, the people of V. were divided in their desires. Many of them were strongly attached to the union and objected to a separation. Jan. 7, 1861, the legislature met in extra session, and subsequently provided for the assembling of a convention to determine what course should be adopted by the state, and passed resolutions recommending the states to appoint commissioners to a national peace convention to be held in Washington. Nothing beneficial resulted from this proceeding, however.

On Feb. 13 a convention met at Richmond, and on Mar. 10 resolutions were introduced declaring secession to be a right and protesting against interference with slavery. During the first week in April the convention refused to secede by a vote of 89 to 45, but the proclamation of Pres. Lincoln, calling for troops, led to the passing, Apr. 17, of an ordinance of secession by a vote of 88 to 55, which was soon ratified by the people, the counties now constituting West V. refusing to be bound by this action.

The state authorities took possession of the custom-house in Richmond, the navy-yard at Norfolk, the U. S. arsenal at Harper's Ferry, and other property; troops were called out, and money was raised for arming and equipping them. May 7 the state was admitted to representation in the confederate congress, and later in the month Richmond was made the seat of the confederate government. From this time, during the whole of the war that followed, V. was occupied by hostile armies and was the region of almost continual military operations, by which it suffered much. There were fought within the state the great battles of Bull Run, Carnifex Ferry, Ball's Bluff, Williamsburg, Winchester, Hanover Court-House, Seven Pines, Fair Oaks, Cedar Mountain, Manassas, Fredericksburg, Chancellorsville, Hanover Junction, the series of battles from the Wilderness to Cold Harbor, in May and June, 1864, Petersburg, Cedar Creek, Fisher's Hill, the battles in the valley, Lynchburg, and Five Forks. During most of the time there were 2 state governments in V., the w. cos. having maintained allegiance to the union and instituted a separate government under federal control. After the surrender at Appomattox Court-House this government was recognized by the president as the lawful one, and for a while the whole state became subject to it. In 1867 V. was made the first military district, under Gen. Schofield. In that year delegates to a constitutional convention were chosen by the voters who had taken an oath of allegiance to the federal government, the majority of the whites opposing the movement. The convention assembled at Richmond in Dec., but the new constitution was not ratified by the people until July, 1869, and the state was not readmitted to representation in congress until Jan. 26, 1870.

Topography.—V. has six great natural divisions extending from n.e. to s.w., and corresponding to the trend of the Atlantic coast on the e. and of the Appalachian range

on the northwest. They differ in geology, climate, soil, and productions. Beginning on the e., they are the tide-water, middle, Piedmont, Blue Ridge, Valley, and Appalachian sections. The tide-water portion is divided by Chesapeake Bay and the large tidal rivers which flow into it into 9 primary and many subordinate peninsulas, no part of which is elevated more than 100 ft. above the sea, and considerable tracts are low and marshy. Middle V., a triangular tract extending from a n. and s. line running through Richmond to the foot-hills of Southwest Mountain, is a wide, undulating plain of no great elevation (perhaps an average height of 400 ft.), through which the many rivers that traverse it have cut their channels to a considerable depth, and are bordered by alluvial bottom-lands. Along the e. base of the Blue Ridge Mountains, and between them and the coast range, the Piedmont division extends from the Potomac and Maryland to the Dan at the North Carolina border. It is 244 m. long, with an average width of 25 m. and an area of about 6000 sq.m. The Blue Ridge division is a still narrower belt. It includes both slopes of the Blue Ridge, and forms the eastern wall of the valley of V., the 5th division, which is a part of the great Appalachian Valley, lying between the Blue Ridge on the e. and the Endless Mountains on the west. The Valley is a broad belt of rolling country from 1200 to 1600 ft. above the sea, diversified by hills and valleys, with several streams. The Appalachian division is a mountainous region traversed by the Alleghany ranges. In V. it is about 260 m. long and from 10 to 50 wide, and comprises 7680 sq. miles. The highest peak in the state, Balsam Mountain (about 5700 ft.), is in the Iron Mts., between the Blue Ridge and the Alleghany range, on the border of North Carolina. The peaks of Otter, in the Blue Ridge, are 3993 ft. high. What is known as the eastern shore is a narrow peninsula extending from the Maryland border to Cape Charles and comprising the counties of Accomack and Northampton.

Nearly all the streams of the state have a s. easterly course. The Potomac, Rappahannock, and James, besides many smaller creeks and rivers, empty into Chesapeake Bay. The Chowan, a river of North Carolina, receives from s. eastern V. the Blackwater and other branches, and the Roanoke, which, like the Chowan, discharges into Albemarle sound, is formed by the Dan and Staunton in the s. part of V. The Great Kanawha, or New River, a tributary of the Ohio, rises in North Carolina and crosses the s. western part of V. The main part of the James is 450 m. long, and tide-water ascends it to Richmond 150 m. from its mouth. The Rappahannock is about 125 m. long, and is navigable from Fredericksburg, where it meets tide-water. The Shenandoah, the largest tributary to the Potomac, rises in 2 branches, w. of the Blue Ridge, and has a course of 170 m., about 100 m. of which are navigable for small boats. The west shore of Chesapeake bay is cleft by numerous bays and arms of the sea, including the great estuaries of the Rappahannock and James and that known as York river, into which the Mattapony and Pamunky discharge. The Atlantic coast of the eastern shore is bordered by a series of sandbars, or islands, pierced by inlets and enclosing Broadwater and other sounds. Warm and mineral springs, some of them of wide repute, abound in the mountain and upland districts. Aside from the numerous localities of historical interest, the state is rich in scenery and in natural curiosities, among which are the natural bridge in Rockbridge co.; Weyer's and Madison's caves in Augusta co., remarkable for their stalactites; and Blowing Cave, near Millboro.

Geology and Mineralogy.—The e. coast is composed of tertiary sands, clays, and marls; further inland, strata of the miocene groups emerge from beneath these, and abut against granite, gneiss, and other metamorphic rocks, at the line of the lowest falls of the principal rivers, the head of navigation, and sites of the chief towns. The mineral resources are as yet mostly undeveloped. In the metamorphic belt are gold mines, copper, iron, etc. There are two upper secondary belts parallel to the Blue Ridge, crossing the James above Richmond, with rich coal deposits. The valley is of the lower Silurian, with rich limestones, hematite iron, and a fertile soil. On the w. borders are found sulphur, salt, obtained from artesian wells, gypsum, lead, etc. The western coal region, cut through by large rivers, is one of the finest in the world. There are also deposits of fine marble, porcelain clay, fire-brick clay, fine granite, soap stone, slate, glass-sand, plumbago, zinc, manganese, waterlime, freestone, greenstone, etc.

Fauna and Flora.—Bears, catamounts, wolves, wild cats, and deer are still found in remote or mt. regions. The beaver, otter, opossum, marten, muskrat, gray fox, red fox, ground hog, rabbit, hare, weasel, red squirrel, gray squirrel, flying squirrel, cotton-rat, etc., are more common. Among wildfowl and birds are the swan, wild goose, gull, heron, fish-crow, teal, many species of duck, the grouse, quail, wild turkey, eagle, turkey-buzzard, lark, robin, dove, oriole, tanager, mocking-bird, bobolink, etc. Rattlesnakes, blacksnakes, moccasin, copperhead snakes, and turtles and terrapins are among the reptiles. In the inland waters are found trout, bass, eels, perch, mullet, pickerel, hog-fish, etc., and the tidal waters furnish abundance of sturgeon, shad, herring, cod, bass, trout, mackerel, perch, and other fish, besides lobsters, crabs, clams, and oysters.

In the tide-water section are extensive forests of pine (the noted yellow), oak, cypress, cedar, and locust, from which large quantities of timber and sawed lumber are obtained. The middle region contains large areas of superior hard pine, black, white, and other oaks, holly, and other trees; the Piedmont has considerable forest land, with oak of many varieties, hickory, tulip-poplar, black walnut, locust, cedar, chestnut, and pine;

the Blue Ridge is mostly covered with forests of oak, hickory, chestnut, locust, and birch; the valley has much superior hard-wood timber, especially oaks and hickories; and in some parts of the Appalachian country are extensive forests that include oak, walnut, tulip-poplar, locust, sycamore, and pine. Plums, persimmons, cherries, crab-apples, grapes, cranberries, blackberries, strawberries, and other fruits and berries grow wild in great abundance. The flora of the state is exceedingly rich.

Climate and Soil.—The climate varies much in different districts. The mean annual temperature for the state ranges from 60° and 64° in the s.e., to 48° and 52° in the valley and Appalachian region, while the annual range, from the severest cold of winter to the greatest heat of summer, is not more than 86°. In the e. and s.e. the summers are hot, and in the vicinity of swampy lands bilious and typhoid fevers prevail. The region lying on and near Hampton Roads is, however, healthful and agreeable at all seasons of the year; and the valley has a healthful climate, the summer heat being tempered by the elevation and the cool breezes, while it is also sheltered by the mts. in winter.

At White Sulphur Springs the average annual rainfall is 37.54 ins.; at Fort Monroe, it is 47.04 ins. The soil of the tide-water division is a light sandy loam, capable of yielding large crops of fruit and vegetables; but it has been to a great extent worn out by superficial cultivation. In middle Virginia much of the land is fertile, and much is poor and sterile. The soils of the Piedmont region, consisting largely of decomposed greenstone, are very fertile, as are also portions of the Blue Ridge country; but where the sandstones prevail on the western slope they are sandy and poor. The valley soil is underlaid with disintegrating limestones, shales, slates, and clays, and is very fertile, and many of the valleys in the Appalachian region are rich and productive.

Agriculture.—The short mild winters and the long summers, with plentiful rains, are conducive to farming. The valley of Virginia produces immense crops of cereals, its corn averaging 38,000,000, its wheat 6,000,000, its oats 8,000,000 bushels annually. The eastern portion of the state is devoted largely to early fruit and vegetables for the northern markets; Piedmont and Albemarle have extensive orchards, vineyards, and peach groves. In the southeast, peanuts are raised in great quantities, averaging frequently forty bushels to the acre, valued at over $2,500,000 annually. The consumption has increased in this country from 2,000,000 bushels in 1885 to 5,000,000 bushels in 1894. Norfolk and Petersburg are the principal markets. A fine table oil is made from them, while locally they are made into a coarse flour. Virginia stands second only to Kentucky in the amount of tobacco produced, and its crop is nearly 70,000,000 lbs. annually. The finest comes from the Middle and Piedmont districts, and coarser grades from the mountain districts. Stock-raising and dairy farming are important industries in some portions of the central and the western counties.

Industries.—The manufacturing interests of the state have been developed slowly, though its abundance of raw material, ample water-power, and convenience of transportation give it marked advantages. The U. S. census of 1890 reported for Virginia, 5915 manufacturing establishments, employing $63,456,799 capital, and 59,591 persons, paying $19,644,850 for wages, and $50,148,285 for materials, and having a combined output valued at $88,363,824. The principal manufactures in the order of value of output are chewing and smoking tobacco, and snuff, flour and grist, saw and planing mill products, iron and steel, fertilizers, cotton goods, brick and tile, boots and shoes, tanned leather, agricultural implements, ships, and woolen goods. Valuable deposits of iron ores, particularly brown hematite, are found in the mountain sections, and over 350,000 tons of pig iron are produced annually, besides large quantities of rolled iron. The gold mines are also of considerable importance, over $1,700,000 having been deposited in the United States mints previous to 1891. This state also produces over 1,000,000 tons of coal annually, mostly bituminous. That mined at Pocahontas is used both for steam purposes and for coking. The largest lead mines in the south are in Virginia, as are also the most productive manganese mines in the country, this state having yielded more than any other. Chesapeake Bay has valuable oyster-beds, the finest on the Atlantic coast, and in 1890 the oyster, clam, terrapin, and other fisheries had an output valued at nearly $5,000,000.

Commerce.—In the fiscal year ending June 30, 1897, the imports of merchandise at the ports of Alexandria, Newport News, Norfolk and Portsmouth, Petersburg, and Richmond aggregated in value $1,392,795; and the exports of domestic merchandise, $40,691,107, the largest entries being at Newport News and Norfolk and Portsmouth, where the total foreign trade amounted to $23,278,890 and $18,703,390 respectively. The leading exports are tobacco, naval stores, cotton, lumber, and garden vegetables. The state has also developed a large general coasting trade, and in this and the foreign trade Newport News has become one of the most important ports on the Atlantic coast of the United States.

Transportation.—The principal railway systems are the Atlantic Coast Line, which is a combination of routes on various connecting lines, by which travel is possible the entire length of the Atlantic coast without change of cars; the Norfolk and Western and its divisions; the Southern, and the Chesapeake and Ohio. The whole number of miles operated in the state exceeds 7000. Other facilities are the James River and Kanawha canal, from Richmond to Buchanan, 198 miles; the Albemarle and Chesa-

peake canal, from Norfolk to Albemarle Sound; and the Dismal Swamp canal, which makes the same connections by another route.

Banks.—On Oct. 31, 1896, there were 37 national banks in operation, with combined capital $4,846,300, deposits $14,000,000, reserve $3,839,337, and outstanding circulation $2,146,099, and 86 state banks, with capital $6,241,365, deposits $14,606,504, resources $24,561,186, and surplus $2,538,487. The exchanges of the year at the clearing-house at Richmond, aggregated $115,412,712.

Religious Denominations, Education, etc.—The leading denominations numerically are the Baptist colored, Methodist Episcopal South, Regular Baptist South, African Methodist, Presbyterian South, Protestant Episcopal, Methodist Episcopal, Disciples, Roman Catholic, and Lutheran. The present public school system of the state, which is similar to that of most of the states, dates its organization from 1870. The general supervision is vested in a superintendent of public instruction, elected every 4 years by joint ballot of the general assembly, and the board of education consists of the governor, attorney-general, and the superintendent. The schools are supported by state and local taxation and a permanent state fund. Substantial aid is received also from the Peabody educational fund. Under existing laws, boards of district school trustees, with the advice and counsel of the superintendents of schools, determine where and how many schools shall be opened in each magisterial district. Reports for 1896 showed, public school enrollment, 361,559; public schools in operation, 8400 (6124 for white pupils and 2276 for colored); value of public school property, $3,000,000; annual expenditure, $1,825,000. There are public normal schools at Petersburg, Farmville, and Rye Cove. The most noted private normal school is the Hampton normal and agricultural institute for colored youth and Indians. Most of these schools are endowed and in a prosperous condition. A university was endowed at Henrico in 1619, and an *Academia Virginiensis et Oxoniensis* planned in 1621, but both came to naught. In 1691 the Colonial Assembly sent a man to England to secure a charter for a college. The Attorney-General objected, and when the petitioner remarked that the colonists had souls to save, he roared, "Souls! Damn the souls! Make tobacco." Nevertheless the charter was given, and the college of William and Mary established. The principal universities, colleges, and professional schools in the states are: The Univ. of Virginia, near Charlottesville (see Virginia, University of): Washington and Lee univ., Lexington; Emory and Henry coll. (M. E., South), Emory; Hampden-Sidney coll. (Presb.), Hampden-Sidney; Randolph-Macon coll. (M. E., South), Ashland; Richmond coll. (Bap.), Richmond; Roanoke coll. (Luth.), Salem; the Virginia military institute, at Lexington; the Hampton normal and agricultural institute (non-sect.), Hampton; Bridgewater college (Bapt.), Bridgewater; New Market polytechnic institute (non-sect.), New Market; Richmond theological seminary (Bapt.), Richmond; Curry coll. (Bapt.), Longfield; Protestant Episcopal theological seminary, Seminary Station; Bishop Payne divinity school (P. E.), Petersburg; the Union theological seminary (Presb.), at Hampden-Sidney (whence it was decided in 1896 to remove it to Richmond); and the Medical Coll. of Virginia, at Richmond. Industrial training is given at Hampton and at the Miller manual labor school at Crozet. There are a number of public libraries containing over 10,000 volumes, the state library at Richmond having over 60,000 volumes. The newspapers and periodicals, 1897, numbered 270.

Government, etc.—The constitution gives the right of voting to every male citizen of the United States 21 years old who has resided in the state one year, and in the co., city, or town, in which he offers to vote three months next preceding any election. A capitation tax of $1 is levied on all citizens 21 years of age, but payment is not a condition of suffrage. Persons entitled to vote and hold office, and none others, may sit as jurors. The gov., who receives a salary of $5000, and lieut.-gov. are elected by the people every four years. The sec. of state, treasurer, and auditor of public accounts are elected every two years by a joint vote of the general assembly. This assembly or legislature consists of a senate of 40 members elected for four years, and a house of 100 representatives elected for two years, each receiving $4 per diem. The sessions, which are biennial, meet on the first Wednesday in December, and are limited to ninety days, unless extended by special vote. The judicial power is vested in a supreme court of appeals, consisting of five judges, elected by the legislature, holding office 12 years and receiving $3000 salary each, circuit-courts, and county courts. By laws of 1877 the real and personal property of a married woman, owned at the time of marriage, is not liable to the control of her husband, or for his debts. As amended by acts of 1878, ownership and liability are made two distinct rights. The husband cannot be held for his wife's ante-nuptial debts. Wilful desertion for five years is cause for divorce. A local option liquor act was passed in 1886. The registration of voters is required in this state. In 1894 a modification of the Australian ballot system, known as the Walton system, went into effect.

The electoral votes have been cast as follows: 1788, Washington, 10, vice-p. scattering; 1792, Washington and Clinton, 21; 1796, Jefferson, 20, vice-p. scattering; 1800, Jefferson and Burr, 21; 1804, Jefferson and Clinton, 24; 1808, Madison and Clinton, 24; 1812, Madison and Gerry, 25; 1816, Monroe and Tompkins, 25; 1820, Monroe and Tompkins, 25; 1824, Crawford and Macon, 24; 1828, Jackson and Calhoun, 24; 1832, Jackson and Van Buren, 23; 1836, Van Buren and Smith, 23; 1840, Van Buren, 23, vice-p. scattering;

1844, Polk and Dallas, 17; 1848, Cass and Butler, 17; 1852, Pierce and King, 15; 1856, Buchanan and Breckenridge, 15; 1860, Bell and Everett, 15; 1864 and 1868, *no vote;* 1872, Grant and Wilson, 11; 1876, Tilden and Hendricks, 11; 1880, Hancock and English, 11; 1884, Cleveland and Hendricks, 12; 1888, Cleveland and Thurman, 12; 1892, Cleveland and Stevenson, 12; 1896, Bryan and Sewall, 12.

FINANCES.—The state debt, according to the United States census report of 1890, amounted to $34,227,234; the county debt, $1,774,535; municipal debt, $14,835,546; and the total combined debt, less the sinking fund, was $50,837,315. The total assessed valuation was $362,422,741. In 1896 the assessed valuations were, real estate, $304,204,590; personal, $94,341,046; total, $398,545,636; tax rate, $4 per $1000; in 1897 the total debt was $24,247,722. For important chapters in the financial history of the state, see REFUNDERS; REPUDIATION; BOND, STATE.

STATE INSTITUTIONS, ETC.—The penitentiary is at Richmond, and in the vicinity of that city is a soldiers' home. There are asylums for the insane at Staunton, Williamsburg, and Marion, and at Petersburg. The agricultural and mechanical coll. at Blacksburg has been well-equipped. There is an asylum for the deaf, dumb, and blind at Staunton, and an industrial reform school for white boys at Laurel. The National Guard, or Virginia volunteers, has an authorized strength of 5104 officers and men, and an actual strength of over 2600. There is also a considerable body of colored infantry. The total available force of the state in time of war is over 246,000.

UNITED STATES INSTITUTIONS.—The most interesting of these are Fort Monroe, begun in 1819 by Gen. Bernard, a former aide-de-camp to Napoleon, and costing nearly $3,000,000; the Gosport navy yard, founded by the British before the revolution, and owned by this country since 1801; the old single turret monitors, laid up in the James river just below Richmond; and the national cemeteries at Arlington, Alexandria, Richmond, Hampton, Fredericksburg, and other places.

POPULATION.—1790, 747,610—292,627 slave, 12,866 free col'd; 1810, 974,600—392,516 slave, 30,570 free col'd; 1840, 1,239,797—448,987 slave, 49,842 free col'd; 1860, 1,596,318—490,865 slave, 58,042 free col'd; 1870 (West V. having been set off), 1,225,163—512,841 col'd; 1880, 1,512,565—631,707 col'd. The population in 1890 was 1,655,980; rank of state in pop., 15. There are 100 cos.; for pop. 1890, see Census Tables, Vol. XV. The largest city is Richmond; pop. 1890, 81,388. At the same date Norfolk had a pop. of 34,871; Lynchburg, 19,709; Petersburg, 22,680; Alexandria, 14,339, and Portsmouth, 13,268. See histories by Campbell (1860); Cooke (1884); Kercheval's *History of the Valley of Virginia.*

VIRGINIA CITY, city and co. seat of Storey co., Nev.; on the Virginia and Truckel railroad; 15 miles n.e. of Carson City, the state capital. It is built on the e. slope of Mount Davidson, a peak of the Washoe range of the Sierra Nevada, seamed by the operations on the rich silver mines, about 6339 ft. above the level of the sea. It contains the Comstock lode, with ores about $\frac{1}{3}$ value of gold, and $\frac{2}{3}$ of silver, discovered in 1859 by a Virginian, hence the name of the city. In this mine is the famous Sutro tunnel, nearly four miles long. Virginia City also contains the Big Bonanza, or Consolidated Virginia, and the California mine. The buildings in Virginia City are principally of stone and brick; the streets are broad, graded at great expense, and without trees. It has many fine residences, is lighted with gas and electricity, and supplied with water from springs at the summit of the Sierra Nevada conducted through iron pipes. It contains a court-house, a Roman Catholic school, agencies of the Nevada bank of San Francisco, and bank of California, churches, theaters, daily and weekly newspapers, public schools, co. and St. Mary's hospitals, high school and miners' union libraries, and St. Mary's school (R. C.). Pop. '90, 8511.

VIRGINIA CITY, a city in s.w. Montana, settled 1863, incorporated 1865; co. seat of Madison co., and capital of the territory until 1875, when the seat of government was removed to Helena. It is situated on the e. slope of the Rocky mts. 110 m. in a direct line from Helena; pop. '90, 675. It is built in Alder gulch, 16 m. long, 5713 ft. above the level of the sea, in the center of a rich gold mining district. In the first 8 years after the discovery of gold in 1863, $30,000,000 worth of gold was taken from this vicinity. Other mineral products are silver, limestone, gneiss, galena, and serpentine. It is connected with Deer Lodge on the Montana Union railroad and with Dillon on the Union Pacific, by stage lines. It has a court-house, jail, churches, a newspaper, a bank, and graded schools. In the vicinity are hot springs with medicinal qualities.

VIRGINIA, UNIVERSITY OF, near Charlottesville, Albemarle co., Va., and 4. m. from Monticello, the home of Thomas Jefferson, who planned and organized it. It was chartered by the state in 1819 and opened in 1825. It is governed by a rector and 9 visitors. In this institution there is no curriculum or prescribed course of study to be pursued by every student. In establishing it, Mr. Jefferson, for the first time in America, threw open the doors of a university in the true sense of the name, providing, as amply as the available means would permit, for thorough instruction in independent schools in all the chief branches of learning, assuming that the opportunities for study thus presented were privileges to be voluntarily and eagerly sought, and allowing students to select for themselves the departments to which they are led by their special tastes and proposed pursuits in life. No honorary degrees are conferred. The course of study embraces—1. A literary and scientific department. 2. A medical department. 3. A law department. 4. An engineering department. 5. An agricultural

department. The library, open to the students, contains about 40,000 vols. The Brooks museums of natural history, consisting of well-selected cabinets of zoology, mineralogy, and geology, and a botanical collection, are arranged in a handsome building, and furnish ample illustration in their several departments. There is a well-appointed infirmary connected with the university for the care and comfort of sick students. Every student on admission deposits the infirmary fee, which entitles him, in case of sickness during the session, to the advice and attention of the infirmary physicians, and, if necessary, to nursing by professional nurses, without additional charge. Attendance on religious services is purely voluntary. The university has productive funds amounting to $262,000. In 1896 the number of professors and instructors was 48; students, 528. Dr. P. B. Barringer, LL. D., was chairman of faculty.

VIRGINIAN CREEPER. See VITACEÆ.

VIRGINIAN QUAIL, or COLIN, *Ortyx,* a genus of birds of the family *tetraonidæ* closely allied to quails and partridges, but differing from both in having a shorter and thicker bill, and a rather more lengthened tail. They are all natives of America. The best-known species is the VIRGINIAN COLIN (*O. Virginiana*), which is abundant in most parts of North America, and in some parts is commonly known by the name of quail, in others by that of partridge. In size it is intermediate between the common quail and the common partridge of Britain. The prevalent color of the plumage is brownish-red, the under parts whitish; but all parts are more or less mottled with different colors. The feathers of the head are capable of being erected into a sort of crest. The call of the male is popularly regarded as resembling the words, *Ah, Bob White!* The coveys of the Virginian quail often approach houses in winter, and mingle with domestic poultry. Great numbers are killed by guns and taken in snares; and in the western and southern states many hundreds are often caught in a day by parties of men on horseback, who drive the coveys into a great cylindrical net. This bird is easily domesticated, and seems well fitted for the poultry-yard. It has been introduced into some parts of Europe, and may almost be regarded as naturalized, although still rare in England.—There are several other species of the genus in Mexico, California, and the n.w. of America, of which one, the CALIFORNIAN COLIN (*O. Californica*), is remarkable for its long and beautiful black crest.

VIRGIN ISLANDS, a group of islands in the West Indies, partly belonging to Denmark, partly to Britain, directly e. of Puerto Rico. The islands and islets are about 50 in number, but of these, only a few are of any considerable size or importance. The total area is about 267 square miles, and the population is 39,000. Three of the islands, St. Thomas (q.v.), St. Croix (q.v.), and St. John, belonging to Denmark, have a total area of 118 square miles, and a population of (1890) 32,786. Spain claims Vieque and Culebra (together 64 sq. miles), the former of which has 3500 inhabitants and the latter is uninhabited. The others are British; total area 58 sq. miles; pop. about '81, 5287; '91, 4639. The chief of the British islands are Tortola, Virgin-Gorda, and Anegada. The chief town is Roadway in Tortola island, with an estimated pop. 400. The characteristic physical features are rugged heights and precipitous coast-lines, marked by numerous bays, havens, and creeks. Extensive tracts of land, possessed by the emancipated blacks, are covered with guinea-grass, which forms good pasturage for cows, sheep, and goats. A valuable mine of copper has been worked at Virgin-Gorda; and gold, silver, and other valuable minerals are said to have been found; but the inhabitants obtain their livelihood chiefly by wrecking. Cotton and sugar are cultivated in small patches, and form, with ginger and indigo, the principal products.

VIRGIN MARY. See MARY.

VIRGIN'S BOWER. See CLEMATIS.

VIRIATHUS, a Lusitanian (i.e., Portuguese) patriot, who energetically strove to prevent his country from falling under the dominion of the Romans. He flourished in the 2d c. B.C. Originally a shepherd, he afterward became a guerrilla chief, and appears to have supported himself (like many of the Lusitanian borderers) by predatory excursions into the neighboring Spanish territory. This mode of life brought him into collision with Rome, and in the year 151 B.C., the proprætor, Ser. Galba, was ordered to invade the country, and reduce the Lusitanians to subjection. By an act of detestable treachery Galba succeeded in destroying a large body of the natives; but the few who escaped (among whom was Viriathus) were inspired with the most implacable animosity toward the Romans, and immediately proceeded to rouse the patriotic passions of their countrymen. Viriathus soon rose into prominence. At first he kept mainly to the mountains, and contented himself with harassing the enemy by sudden and fierce descents, but in 147 (having been formally chosen leader in a season of great peril) he gave battle to Vetilius, the Roman proprætor, near Tribola (a town of Lusitania, s. of the Tagus), and inflicted on him a severe defeat. In the course of the next two years he repeatedly came off victorious in conflict with Roman armies; until in 144 the consul, Q. Fabius Æmilianus, encountered him in Andalusia with a large army of 15,000 foot and 2,000 horse, and Viriathus was driven back into his native fastnesses. But the Spanish tribes themselves now broke out in insurrection against their foreign masters; and after 143 the Romans had both a Numantine and a Lusitanian war to wage. The

general sent against Viriathus was the proprætor, Q. Pompeius, who, after a slight temporary success, was utterly crushed at the "hill of Venus," and forced to take refuge at Corduba (in Andalusia), while the conqueror wasted all the country round the Guadalquivir. Next year (142), the Romans were more fortunate. Q. Fabius Servilianus, consul, conducted the war, and succeeded in driving Viriathus once more out of Spain, and in annihilating several guerrilla bands; but in 141 a terrible reverse befell him near Grisane, when the whole of his army was hopelessly surrounded in a mountain-pass, and the story of the Caudine Forks (q.v.) was repeated, by its unconditional surrender. Viriathus, like Caius Pontius, showed a noble magnanimity in his hour of supreme triumph; he allowed his captives to go away free and unhurt on condition of Servilianus allowing the Lusitanians to retain their independence, and accepting their alliance. His terms were accepted, and the Portuguese patriot seemed to have triumphed over his colossal adversary; but in 140 the consul, Q. Servilius Cæpio (brother of Servilianus), having received the command in Further Spain, suddenly and treacherously resumed the war against Viriathus, and fearing lest he should not succeed in fair fighting, bribed some Lusitanian envoys (who had been sent to him by Viriathus with offers of peace) to murder their master, which they did while he lay sleeping in his tent. The death of this heroic chief was practically the ruin of Lusitanian independence; for though the followers of Viriathus elected another leader in his place, and strove to carry on the war, they could scarcely maintain themselves in the field for the rest of the year, and were then glad to acknowledge the supremacy of the Romans.

VIRTUAL VELOCITY. See WORK.

VI'RUS (the Lat. for a *poisonous liquid*) is a term used in medicine to signify those mysterious poisonous agencies which produce zymotic diseases (q.v.), such as small-pox, measles, scarlatina, the various forms of continued fever, ague, whooping-cough, cholera, syphilis, glanders, hydrophobia, etc. While each of these morbid poisons (as they are frequently called) has a definite and specific action, they collectively obey certain laws. For example (1.), their actions are variously limited, some affecting only one organ or system of organs, while others involve two or more organs or system of organs. Thus, in bronchocele or goiter, we have an example of a poison acting only on the thyroid gland, while in whooping-cough and hydrophobia all the organs supplied by the pneumogastric nerves (q.v.) are affected, and, in paludal or malarial poison most of the organs. (2.) Morbid poisons, like medicines and ordinary poisons, have their period of latency, which, however, here is usually much prolonged. While a medicine, e.g., is seldom longer than a few hours in exhibiting its effects, the poisons of scarlatina, measles, and small-pox remain latent in the system for at least seven, ten, and sixteen days respectively; while that of paludal fever and hydrophobia may be dormant for a year or upward. (3.) When several tissues or organs are acted on, the actions may be simultaneous, but are more commonly consecutive, a considerable interval often elapsing between the attacks. (4.) Another law of morbid poisons is, that two may co-exist in the same person; for example, small-pox and cow-pox have often been seen at the same time in the same person. In this case, each disease runs its course unaffected by the other; but most commonly, when two co-exist, one lies latent while the other runs its course. Thus, a case of intermittent fever may suddenly subside, and small-pox make its appearance; on recovery from this disease the intermittent fever may return.

Among the peculiarities presented by morbid poisons, the following points must be noticed: (1.) In experiments made on the inoculation of the small-pox virus by Dr. Fordyce, it was found that extremely diluted poison, if it acted at all, produced the same effects when introduced into the system as the concentrated virus. Hence it may be inferred that the intensity of the disease is not proportional to the amount of virus received into the system. (2.) Women in child-bed may not only engender a special poison of this class—that of puerperal fever—but are highly susceptible of these poisons, and almost always succumb to their action. (3.) Another peculiar law of morbid poisons, and one wholly unknown in medicinal substances, is, as Dr. Aitken remarks, "the faculty which the human body possesses of generating to an enormous extent a poison of the same nature as that by which the disease was originally produced. A quantity of small-pox matter not so big as a pin's head will produce many thousand pustules, each containing fifty times as much pestilent matter as was originally inserted; and the miasmata secreted by one child laboring under whooping-cough are sufficient to infect a whole city." A remarkable illustration of the development of syphilitic poison from a single infant over a whole province is given in the article SYPHILIS. (4.) A still more remarkable fact is, that many of these morbid poisons possess the property of seldom occurring more than once in the life of the same individual. This is the case with scarlatina, measles, small-pox, whooping-cough, and (to a less extent) typhoid and typhus fevers. (5.) This class of poisons is powerfully influenced by climate, and probably by the nature of the soil. Thus, the severe forms of typhus so common in Great Britain are hardly known in warmer climates, and the influence of cold weather on cholera and plague are well known. See TYPHUS: ZYMOTIC DISEASES. For the well-established theory that attributes a large number of diseases (including chicken-cholera, splenic-fever, perhaps phthisis, cholera, and yellow fever) to microbes or specific bacilli (small organisms), see GERM THEORY: MICROBES.

VISCHER, Friedrich Theodor, b. Germany, 1807; educated at Tübingen, where he studied theology. He soon devoted himself to æsthetics and philosophy, and after travels in Italy and Greece, became professor of æsthetics at Tübingen in 1844, and remained there with the exception of the years 1855–66, when he lived in Zürich. His principal book is his *Æsthetik* (1848–58). He d. 1887.

VISCONTI, a Lombard family which rose to sovereign rank in northern Italy in the 13th c., and was equally distinguished by the share it took in the political contests of the middle ages, and by the services which it rendered to literature and science. The name Visconti is derived from the Latin *vicecomites,* and at first was merely the title of an office, but it gradually became a family surname, though when it came to be applied to this family authentic history fails to explain. The family descended, according to tradition, from Desiderius, the last king of the Lombards, and belonged to the feudal nobility of northern Lombardy, having large estates near lakes Como and Maggiore. The first who appears prominently in history is Ottone, who became, in 1078, viscount of the archbishopric of Milan. The great Lombard families having, in course of time, split up into a multitude of lines, each in possession of a petty sovereignty, the Visconti on this account rose into comparative importance, more especially when, in 1262, another Ottone was appointed archbishop of Milan by pope Urban IV. This appointment being considered by the people an infringement of the rights of the chapter, was opposed by them; and their leader, Martino della Torre, and his successors, kept possession of the property of the see, and forced the archbishop to exile himself for 15 years. At last, the exiled Ottone advanced at the head of a body of exiles and emigrants upon Milan, defeated and captured his rival in a bloody and desperate conflict near Desio (Jan. 21, 1277), and entered the city amid the acclamations of the people, who hailed him as archbishop and perpetual lord of Milan. But he was not permitted to enjoy his newly-acquired dignities undisturbed, for, during the eleven years of his temporal sovereignty, he was engaged in almost uninterrupted warfare with the Torriani; and the contest was continued by his grand-nephew Matteo, who was chosen "captain of the people" in 1288. Ottone continuing in the archbishopric till his death in 1295. Matteo proved himself a prudent and temperate ruler, and his influential position was recognized by the emperor Adolf, who created him imperial vicar in Lombardy. Expelled by the Torriani and their allies in 1302, he was restored in 1311 by the aid of the emperor Henry VII., and reappointed imperial vicar in consideration of the payment of 40,000 florins; and Pavia, Alessandria, Tortona, Cremona, Bergamo, Lodi, etc., having been forced to acknowledge his authority, the family became more powerful than ever. Unfortunately, however, a quarrel arose with pope John XXII. regarding the appointment to the Milan archiepiscopate; and Matteo, obstinately refusing to yield to the papal pretensions, was condemned as a confirmed heretic, and himself and his descendants stigmatized as perpetually infamous (Mar. 14, 1322). The people, despite their profound esteem and affection for their ruler, were horror-struck at this solemn denunciation; and the feeling that so many of his friends were falling away from him so preyed on Matteo's mind, that he died in June, 1322, three months after his excommunication. His son, Galeazzo I., was chosen his successor, and immediately the pope proclaimed a religious crusade against the heretical Visconti, and the "holy army" under Raymond of Cardona advanced in 1323, on Milan, committing the most horrible ravages during its march. But though the Visconti could not directly oppose such an overwhelming force, Galeazzo's brother Marco, an able and experienced warrior, hovered round the disorderly host, cutting off detached parties; and the emperor Lewis (of Bavaria) having sent a body of troops to aid the Visconti, the crusaders were driven back, totally defeated at Vavrio on the Adda (1324), and the remnant, with their leader Cardona, captured. Soon after, Galeazzo, by the intrigues of his ambitious brother Marco, was perpetually exiled, yet his eldest son, Azzo V., succeeded him, while Pope Nicolas confirmed the third son, Giovanni, in the archiepiscopate—events which led Pope John XXII., for the sake of maintaining some authority over Milan, to recall the excommunication he had pronounced against the Visconti. Azzo was the greatest prince of the race, and ruled Milan wisely and well; devoting his attention to the improvement and esbellishment of the city, in which labor he was aided by the painter Giotto (q.v.) from Florence, and the sculptor Balducci from Pisa. As great in war as in peace, he extended his sway over almost the whole of Lombardy; and on his death in Aug., 1339, 3,000 citizens of Milan voluntarily assumed the garb of mourning. The council-general of Milan elected his two uncles, the archbishop Giovanni and Lucchino, as joint rulers in his stead; and on the latter, who was an able, resolute, and unscrupulous prince, wholly devolved the cares of the temporal sovereignty. Under his sway, Montferrat was added to the dominions of the Visconti; Pisa became tributary; a regular police was established; all offenders were punished with impartial severity; and a summary judgeship of appeals (*exgravator*), open only to foreigners to prevent party bias, was established. But the vices of suspicion, lust, and revenge threw a deep gloom over Lucchino's eminent qualities, led him into the commission of many cruel and tyrannical acts, and indirectly caused his own death by poison in Jan., 1349. From this time, the mild and peaceful archbishop reigned alone, availing himself of the assistance of his nephews in the more arduous tasks of government. He purchased Bologna for 200,000 florins in

1350; in 1353 accepted the lordship of Genoa, which had been almost crushed by its rival, Venice; and taking up the quarrel of his new subjects, equipped a fleet which, under Paganino Doria, gained a complete victory over the Venetians. He was the generous patron and friend of Petrarch, and the last good prince of the Visconti family. His three nephews conjointly succeeded him in Oct., 1354; but in 1355 the eldest had died of poison, and his dominions were shared between the other two, GALEAZZO and BARNABO. Both princes were men of pre-eminent ability, but irreclaimably vicious, the latter being a very monster of cruelty. Bologna, which belonged to Barnabo, fell into the hands of the pope, who excommunicated Barnabo for attempting to recover it; but the Visconti prince laughed at the Holy Father's curse, and swore that he would be both pope and emperor in his own dominions. Innocent VI. then sent legates to him to propose terms, but the young savage compelled the unfortunate messengers to tear their master's bulls to fragments, and swallow them piece by piece. One of the legates, on becoming pope as Urban V., took revenge by proclaiming a crusade against Barnabo, which was joined by all the principal Italian princes; the Romagna and the borders of Lombardy were desolated by a long desultory strife; and though Barnabo was ultimately forced to accept a sum of money in place of Bologna, he took a humorous revenge on his ecclesiastical antagonists by compelling the clergy in his dominions to pay all the expenses of the war. One act of his, however, may be mentioned with commendation; he issued an edict forbidding even the mention of the names of "Guelf" and "Ghibelline" under pain of having the tongue cut out; and his well-known stern adherence to such promises put an end to this long and mischievous controversy. His brother Galeazzo, who had established his residence at Pavia, was the "Mæcenas" of his time; he steadily befriended Petrarch; founded, under his direction, the university of Pavia; and collected a considerable library. The invention known as "Galeazzo's Lent," a system of torture calculated to prolong the victim's life for 40 days, stamps him with the family character of cruelty. On Galeazzo's death, his son, GIAN-GALEAZZO, succeeded (1378) him in Pavia and its dependencies; and by treacherously seizing and imprisoning his uncle, Barnabo of Milan, became sole ruler of Lombardy. He had all the great qualities and most of the vices of his race, and openly aspired to the sovereignty of Italy; conquering Padua, Verona, Vicenza; extending his dominions to the gates of Florence, which he also attacked; and purchasing from the emperor Wenceslas the absolute sovereignty of his dominions; with the title of *duke of Milan*, for 100,000 gold florins. This curtailment of the empire, however, displeased Germany, but the palatine Ruprecht, who invaded Lombardy, received such a lesson from the condottieri of Alberico da Barbiano at Brescia as caused him to gladly seek the n. side of the Alps. Florence, the only remaining obstacle to the accomplishment of the ambitious Visconti's scheme, was on the point of surrendering, when Gian died of the plague in 1402. He was a great patron of letters and science, gathered eminent men of all classes around him, reorganized the university of Piacenza, established a magnificent library, constructed the famous bridge over the Ticino at Pavia, and commenced the erection of the cathedral of Milan. His daughter, Valentina, married Louis, the younger brother of Charles VI. of France, and became grandmother of Louis XII., who upon this relationship founded his claims to the Milanese. His sons, GIAMMARIA VISCONTI (Giovanni-Maria) and FILIPPO MARIA VISCONTI, reigned in succession; but the former, who was cowardly, suspicious, and of a cruelty partaking of insanity, was, in the interest of his subjects, stabbed to death, May 16, 1412; and the younger brother, equally timorous and suspicious, and of only average cruelty, became sole ruler. The Venetians on the e., the marquis of Montferrat on the w., and the pope on the s., were rapidly curtailing his dominions, when, by a happy stroke of policy, he espoused Beatrice di Tenda, the widow of a condottieri leader, and thus obtained the services of a veteran band of soldiers. His fortunate choice of Carmagnola (q.v.) as his general led to the restoration of the former boundary line of his dominions; and on his quarrel with the soldier who had served him so well, he was sagacious enough to supply his place by others as nearly equal in ability as could be obtained. In 1441 he engaged the services of Francesco Sforza, to whom he gave his natural daughter Bianca in marriage; and on his death in 1447, the Visconti family was succeeded by that of Sforza (q.v.) in the lordship of the Milanese. Collateral branches of the Visconti still exist in Lombardy. See Lilla's *Famiglie Celebri Italiane*, Verri's *Storia di Milano*, and Muratori's *Annali de Italia*.

VISCONTI, a family of archæologists and architects, the first of whom to rise to prominence was GIOVANNI BATTISTA VISCONTI, a native of Sarzana, who settled at Rome, and, after making for himself a great name as an archæologist, succeeded Winckelmann as prefect of the antiquities of Rome. He was employed by Clement XIV. and Pius VI. to collect works of ancient art for the museum of the Vatican ("Museo Pio Clementino," as, from its two principal benefactors, it was called); and afterward, in 1778, commenced the writing of the letter-press which was intended to accompany the series of engravings of that splendid collection. He died in 1784.—ENNIO-QUIRINO VISCONTI, eldest son of the former, was born at Rome, Nov. 1, 1751, and was educated by his father, who intended him for the church. This profession, however, he afterward refused to adopt, and was for a time disowned by his father. But at last, in 1778, the old man was glad to call his

son to his aid, and together they prepared the first volume of the engravings of the *Museo Pio Clementino*. In 1784 he edited alone the second volume of the same series; he was also appointed conservator of the Capitoline museum. The series of engravings of the *Museo* was regularly issued, the seventh and last volume being published in 1807. When Rome fell into the hands of the French, Visconti became a member of the provisional government, and afterward one of the five consuls; but in Nov., 1799, the arrival of the Neapolitan army forced him to emigrate to France, and from this time he settled at Paris. His great reputation as an archæologist having been long recognized among the learned men of the French capital, he was made an administrator of the Louvre, and professor of archæology; and drew up a catalogue of the works of art in the new museum (many of the items being his old familiar acquaintances of the Vatican) which from the frequent raids of Napoleon on foreign collections, required to be frequently re-edited and enlarged. In 1804 he was requested by the emperor to select and publish a series of portraits of the distinguished men of ancient Greece and Rome; and this, probably the greatest of his works, appeared in two parts, *Iconographie Grecque* (3 vols. 4to, 1808) and *Iconographie Romaine* (1 vol. 4to, 1817). Contemporaneously, Visconti issued from time to time papers and dissertations on particular objects of ancient art. In 1815 he came to London by express desire of the British government, to fix a fair price for the Elgin marbles (q.v.), and on his return wrote a memoir explanatory of these sculptures. His last work was to complete his *Illustrazioni di Monumenti scelti Borghesiani* (Rome, 1821). He died after a long illness, Feb., 1818, and his death was a source of grief to the learned throughout Europe, many of whom came from great distances to attend his funeral. Besides his immense antiquarian knowledge, Visconti possessed an extensive acquaintance with the history, languages, mythology, and manners of the classic age. A complete collection of his works was commenced at Milan in 1818, but has not been completed. See *Antologia* of Florence, No. 18; Tipaldo's *Biografia degli Italiani Illustri;* and Maffei's *Storia della Letteratura Italiana.*—His younger brother, Filippo Aurelio, was also an eminent archæologist, and was president of the commission of antiquities and fine arts at Rome from 1809 to 1814. He edited the *Museo Chiaramonti*, a sequel to the *Museo Pio Clementino*, and published several other works; but his chief attention was bestowed upon numismatology. He died at Rome in 1830.—Louis Joachim Visconti, the son of Ennio Quirino, was born at Rome in 1797, and after a careful education at Paris, was apprenticed to an architect. His progress in his profession was rapid, as he was appointed an inspector of public buildings as soon as his apprenticeship had expired, and shortly afterward became one of the architects and surveyors of Paris, and architect of the Bibliotheque Royale in 1825. His works include various public monuments in honor of eminent Frenchmen, some of the first fountains of Paris, the tomb of Napoleon I., and various hotels and private residences, the chief of all being the plans for the completion of the Louvre on a most magnificent scale. Visconti died at Paris, Dec. 29, 1853.—The nephew of the preceding, Pierre-Hercules Visconti, is a celebrated archæologist and professor of archæology in the national academy of France, at Rome.

VISCOSITE, a name given by Professor Henry Wurtz to one of the constituents of the mineral *grahamite.* (See Irisite.) Viscosite forms from 15 to 20 per cent of this mineral, and also exists in some of the rock oil of Pennsylvania. It is obtained by digesting grahamite with ether or mineral naphtha, and distilling off the solvents. It is a translucent, dark brown, lustrous substance, having a peculiar balsamic odor, and being very brittle when cold. When warmed it acquires a viscosity like healing wax, and is very ductile. It appears to be a hydrocarbon free from oxygen.

VISCOUNT (Lat. *vice*, in place of, and *comes*, earl), originally the officer who acted as deputy to the earl, the earl being the king's immediate officer within his county. When the title of earl, originally personal, became hereditary, which took place in England under William the conqueror, a deputy had necessarily to be appointed in all cases where he was a minor, or otherwise incapacitated from discharging the duties of his office. This deputy gradually became a permanent officer, otherwise known as the sheriff, whose Latin designation continued to be *vicecomes.* The hereditary title of viscount is a degree of nobility unconnected with office. It was first granted in England to John Beaumont, created a peer by the title of viscount Beaumont in 1440. A viscount is now the fourth degree of nobility in the United Kingdom. His coronet consists of a chased circlet of gold, round which are ranged an indefinite number of pearls, nine of them being most generally shown, smaller than those of a baron's coronet, and in contact with each other. The mantle is scarlet, and has two doublings and a half of ermine. A viscount is styled "right honorable;" his wife is a viscountess; his eldest son has no courtesy title of peerage, but all his sons and daughters are styled "honorable."

VISCUM. See Mistletoe.

VISE (*escalier à vis*), a spiral or corkscrew staircase, the steps of which wind round and rest on a perpendicular pillar, called the newel (q.v.). In the Norman style, the steps rested on a spiral arch; but in later times, the steps were formed of single stones, stretching from the newel to the wall. This kind of staircase was that most generally used in mediæval buildings.

VISEU, an episcopal city of Portugal, in the province of Beira, stands in a wide, fruit-producing plain, at the height of 1770 ft. above sea-level, 46 m. n.e. of Coimbra. Its cathedral is a striking flamboyant edifice, and contains a number of excellent pictures by Gran Vasco, the Portuguese Fra Angelico. In the vicinity is the Roman camp, called Cava de Viriato. The town, which is one of the oldest in the country, contains other Roman as well as Gothic and Moorish remains. A large fair is held here. Pop. '90, 8360.

VISHNI-VOLOTCHEK, a t. of Russia, in the government of Tver, about 230 m. s.e. of St. Petersburg by railway. It is situated on the Tzna, on the Vishni-Volotchek water-route constructed by Peter the Great, and connecting the navigation of the Baltic and Caspian seas, by means of the Volga, etc. There is a very extensive transit-trade. An immense quantity of corn passes through the town every year. Pop. '80, 38,250.

VISHN'U is the second god of the Hindu triad, but is considered by his worshipers to be the supreme deity of the Hindu pantheon. See TRIMÛRTI and VAISHN'AVAS. The word is derived, by *S'ankara* (q.v.), in his commentary on the thousand names of Vishnu, and by other commentators after him, from *vish*, encompass, or *vis'*, penetrate; when, according to them, it would imply the deity who encompasses or penetrates the whole universe, both as regards its exterior appearance and its inward essence. A similar etymology is assigned to the word by *Yâska* (see NIRUKTA) in his gloss on the R'igveda; but as in this Veda, Vishnu does not yet embody the notions connected with him at the epic and Purânic period of Hinduism (see INDIA, sec. *Religion*), Yâska does not impart to the name the implied sense given to it by the commentators just mentioned. In the R'igveda, Vishnu is a representation of the sun, who "strides through the seven regions of the earth," and "in three ways plants his step" (or, as Yâska explains, plants his steps so as to become threefold). And, according to one predecessor of Yâska, these three steps mean the manifestation of the sun at its place of rising, on the meridian, and at its place of setting; or, according to another, its manifestation on earth, in the intermediate space, and in heaven; when—as a later commentator observes—in the first of these manifestations, Vishnu represents fire; in the second, lightning; and in the third, the solar light. From this position which Vishnu holds in the R'igveda (see VEDA), it results that he was not regarded there as supreme, or even as equal, to other deities, who, at the Vedic period, occupied a foremost rank. He is extolled in several hymns as having "established the heavens and the earth," as "being beyond mortal comprehension," and so forth; but he is there also described as having derived his power of striding over the world from *Indra* (q.v.), and as celebrating the praises of this god. He is frequently invoked together with the latter, but apparently always as inferior to him; and often, too, he occurs in company with a number of other gods, such as Varun'a, the Maruts, Rudra, Vâyu, the luminous deities called *Âdityas*, and others, without any distinction being drawn in their respective rank. Fewer hymns, moreover, are separately devoted to his praise than to that of Agni, Indra, or other prominent gods of the Vedic period; and it deserves notice, too, that at that period he was not yet included among the Âdityas, for only at the epic period, when the number of these deities, originally varying from six to eight, was raised to twelve, Vishnu was included in it—he then being named as the foremost of these luminous offsprings of Aditi, or space.

Although some of the Brâhman'as of the Vedas (q.v.) already show the progress which the solar Vishn'u had made in the imagination of the people, and although they contain the germ of several legends, which, at a later time, became fully developed, the really mythological character of this god, as the basis of the divine worship now paid him by a large class of the Hindu population, belongs to the epic poems—the *Râmâyan'a* and *Mahâbhârata* (q.v.)—and to the *Purân'as* (q.v.). In the Mahâbhârata, Vishn'u is often identified with the supreme spirit; but while in some portions of this poem—the different parts of which belong to different epochs of Hindu antiquity—he is thus regarded as the most exalted deity; he is again, in others, represented as paying homage to S'iva (q.v.), the third person of the Trimûrti, and as acknowledging the superiority of this god over himself. Taking, therefore, the Mahâbhârata as a whole, he does not occupy, in this epos, the exclusive supremacy which is assigned to him in the Râmâyan'a, and still more in those Purân'as especially devoted to his praise.

The large circle of myths relating to Vishn'u, in the epic poems and Purân'as, is distinguished by a feature which, though not quite absent from the mythological history of S'iva, especially characterizes that of Vishn'u. It arose from the idea, that whenever a great disorder, physical or moral, disturbed the world, Vishn'u descended "in a small portion of his essence" to set it right, to restore the law, and thus to preserve creation. Such descents of the god are called his *Avatâras* (from *ava* and *tr'î*, descend); and they consist in Vishn'u's being supposed to have either assumed the form of some wonderful animal or superhuman being, or to have been born of human parents, in a human form, always, of course, possessed of miraculous properties. Some of these Avatâras are of an entirely cosmical character; others, however, are probably based on historical events, the leading personage of which was gradually endowed with divine attributes, until he was regarded as the incarnation of the deity itself. With the exception of the last, all these Avatâras belong to the past; the last, however, is yet to come. Their number is generally given as ten, and their names in the following order: 1. The fish-; 2. The tortoise-; 3. The boar-; 4. The man-lion-; 5. The dwarf-; 6. The Paras'u-Râma-;

7. The Râmachandra, or, briefly, Râma-; 8. The Kr'ishn'a and Balarâma-; 9. The Buddha-; and 10, The Kalki- or Kalkin-Avatâra. This number and enumeration of Avatâras, however, was not at all times the same. The Mahâbhârata, though also mentioning ten names, successively the Hansa-, tortoise-, fish-, boar-, man-lion-, dwarf-, Paras'u-Râma-, Râma-, Sâtvata-, and Kalkin-Avatâras. The Bhâgavata-Purân'a speaks of twenty-two Avatâras of Vishn'u, which, for instance, also comprise Pr'ithu (q.v.), Dhanvantari, the god of medicine, and Kapila, the reputed founder of the Sânkhya (q.v.) philosophy. Other works have twenty-four Avatâras, or even call them numberless; but the generally-received Avatâras are those ten mentioned before, an idea of which may be afforded by the following brief account.

1. The *Matsya-* or *fish-Avatâra.*—When, at the end of the last mundane age, the Bhâgavata-Purân'a relates, Brahman, the first god of the Trimûrti, had fallen asleep, a powerful demon, *Hayagrîva,* stole the Vedas which had issued from the mouth of Brahman, and lay by his side. About that time, a royal saint, *Satyavrata,* had by his penance attained the rank of a Manu, and Vishn'u, who had witnessed the deed of Hayagrîva, and intended to slay him, assumed for this purpose the form of a very small fish, and glided into the hands of the saint when the latter made his daily ablutions in the river. Manu, about to release the little fish, was addressed and asked by it not to expose it to the danger that might arise to it from the larger fish in the river, but to place it in his water-jar. The saint complied with its wish; but in one night the fish grew so large, that at its request he had to transfer it to a pond. Yet soon the pond also becoming insufficient to contain the fish, Manu had to choose a larger pond for its abode; and, after successive other changes, he took it to the ocean. Satyavrata now understood that the fish was no other than *Nârâyan'a* or Vishn'u, and, after he had paid his adoration to the god, the latter revealed to him the imminence of a deluge which would destroy the world, and told him that a large vessel would appear to him, in which he was to embark together with the seven Rishis, taking with him all the plants and all the seeds of created things. Manu obeyed the behest of the god: and when the water covered the surface of the earth Vishn'u again appeared to him in the shape of a golden fish with a single horn, 10,000 miles long; and to this horn Manu attached the vessel, by means of Vishn'u's serpent serving as a cord. While thus floating in the vessel, Manu was instructed by the fish-god in the philosophical doctrines and the science of the supreme spirit; and after the deluge had subsided, the fish-god killed Hayagrîva, restored the Vedas to Brahman, and taught them to the Manu Satyavrata, who in the present mundane age was born under the name of *S'râddhadeva,* as the son of Vivasvat.—A fuller account of this Avatâra is given in the *Matsya-Purân'a,* where the instruction imparted to Manu by the fish-god includes all the usual detail contained in a Purân'a (q.v.), that relating to creation, the patriarchs, progenitors, regal dynasties, the duties of the different orders, and so forth. In the Mahâbhârata, where the same legend occurs, but without either that portion concerning Hayagrîva, or the instruction imparted by the fish, there is, besides minor variations, that important difference between its story and that of the Purânas, that the fish is not a personification of Vishn'u, but of Brahman, and that the deluge occurs in the present mundane age, under the reign itself of the Manu, who is the son of Vivasvat.—The origin of this Avatâra is probably a kindred legend, which occurs in the *S'atapathabrâhman'a,* of the White Yajurveda (see Veda); but there the fish does not represent any special deity, and the purpose of the legend itself is merely to account for the performance of certain sacrificial ceremonies.

2. The *Kûrma-* or *tortoise-Avatâra.*—When, of old, the gods felt their powers impaired, and were desirous of obtaining *Amr'ita,* the beverage of immortality, Vishn'u directed them to churn, together with the demons, the milk-sea, by taking the mountain *Mandara* for their staff, and his serpent *Vâsuki* for their cord, the gods to stand at the tail, and the demons at the head of the serpent; while he himself consented to support the mountain on his back, after having assumed the shape of a gigantic tortoise. The result of this churning of the sea of milk, was, besides the ultimate recovery of the Amr'ita, the appearance of a variety of miraculous things and beings; but it also led to a violent contest between the gods and demons, in which the latter were defeated. See Râhu.—The idea of the lord of creation assuming the shape of a tortoise, and that of sacrificial liquids, especially clarified butter, becoming tortoise-shaped (*Kûrma,* the word for tortoise, meaning literally, "badly or slowly going"), occurs also in the Yajurveda; but the legend on which the tortoise-Avatâra of Vishn'u is based seems to belong entirely to the post-Vedic period of Hinduism.

3. The *Varâha-* or *boar-Avatâra.*—It is supposed to have taken place when, at the period of creation, the earth was immersed in water, and Vishn'u, in order to raise it up, assumed the form of a gigantic boar. In the earlier recension of the *Râmâyan'a* and the *Linga-Purân'a,* it was Brahman, the creator of the universe, who transformed himself into a boar for rescuing the earth from its imperiled position; and in the *Black Yajurveda,* where this idea is first met with, it is likewise said that the lord of creation upheld the earth, assuming the form of a boar. At a later period, however, this Avatâra is generally attributed to Vishn'u. Between both conceptions there is, however, also this great difference, that in the former the transformation of the deity into a boar has apparently a purely cosmical character, whereas in the latter "it allegorically represents the extrication of the world from a deluge of iniquity, by the rites of religion."

(Wilson's translation of the *Vishn'u-Purân'a*, 2d ed., by F. Hall, vol. i. p. 59, note.) For the boar, as an incarnation of Vishn'u, is the type of the ritual of the Vedas. He is described as the sacrifice personified; his feet being the Vedas; his tusks, the sacrificial post to which the victim is tied; his teeth, the sacrificial offerings; his mouth, the altar; his tongue, the fire; his hairs, the sacrificial grass; his eyes, day and night; his head, the place of Brahman; his mane, the hymns of the Vedas; his nostrils, all the oblations; his snout, the ladle of oblation; his voice, the chanting of the Sâmaveda; his body, the hall of sacrifice; his joints, the different ceremonies; and his ears as having the properties of voluntary and obligatory rites (*Vishn'u-P.*, vol. i. p. 63); and similar descriptions of the boar occur in the Harivan's'a (q.v.) and elsewhere; besides those relating to the immense size and wonderful appearance of the mysterious animal. In the *Bhâgavata-Purân'a*, another legend is also connected with this incarnation of Vishn'u, still more distinctly proving that at the Purân'ic period, it was viewed in a purely religious light. According to this legend, *Jaya* and *Vijaya*, two doorkeepers of Vishn'u, once offended some Munis who claimed admission to the paradise of Vishn'u, and in consequence were doomed to lose their position in Vishn'u's heaven, and to be reborn on earth. They became thus the sons of *Kas'yapa* and *Diti*, under the names of *Hiran'yakas'ipu* and *Hiran'yâksha*. The former subdued the three worlds, and the latter went straight to heaven, to conquer also the gods. Thus threatened in their existence, the gods implored the assistance of Vishn'u; and Vishn'u, who at that period was the mysterious or primitive boar, slew Hiran'yâksha. A similar contest between Vishn'u as boar and numerous demons, the progeny of Diti, always ending in the defeat of the latter, is also described in the *Mokshadharma*, one of the later portions of the Mahâbhârata; and from this and similar descriptions, it follows that the boar-Avatâra had gradually lost its original character, and assumed that common to the remaining Avatâras, of representing the deity as become incarnate, for the purpose of remedying moral or religious wrong, or of destroying influences hostile to the pretensions of the Brâhmanic caste.

4. The *Nr'isinha-* or *man-lion-Avatâra.*—*Hiran'yakas'ipu*, the brother of the demon Hiran'yâksha just mentioned, had resolved to become a sovereign of the three worlds, and exempt from death and decay. To attain this end, he practiced severe austerities, and ultimately received from Brahman, as the desired reward, a promise that he should become a supreme ruler, and death should not accrue to him from any created being, neither within his abode nor without, neither by day nor by night, neither in heaven nor on earth, nor by any kind of weapon. Possessed of the grant of this boon, he now gave course to the hatred he had conceived against Vishn'u for having killed his brother Hiran'yâksha. He oppressed all the gods, robbed them of their shares in the sacrifices, and threatened their destruction. But he had a son, *Prahrâda* or *Prahlâda*, who, through his religious studies and pious conduct, had become a devout worshiper of Vishn'u. When Hiran'yakas'ipu became aware of his son's partiality for this god, he first endeavored to impart to him his own hostile feelings against Vishn'u, but failing in this, resolved to kill him. All the means, however, he employed to this end remained vain; and when at last, Hiran'yakas'ipu, about to cut off the head of his son, sneeringly asked him why Vishn'u, who, as he asserted, was everywhere, should not be present also in a pillar in the hall, which he struck with his fist, Vishn'u suddenly made his appearance in the shape of a being neither man nor animal, in that of a man-lion of fearful aspect and size; and after a violent struggle with the demon, killed him in tearing his heart out with his finger-nails. Prahlâda was then installed by him as sovereign over the demons, and at the end of a pious reign, obtained final liberation.

5. The *Vâmana-* or *dwarf-Avatâra.*—Prahlâda's son was *Virochana*, and his son was *Bali*. The latter, after having conquered Indra (q.v.), ruled over the three worlds, and filled the gods with dismay for their future prosperity. They had, in consequence, recourse to Vishn'u; and when, at one time, Bali was celebrating a grand sacrifice, Vishn'u, assuming the shape of a dwarf, humbly approached the demon king. Pleased with the devout and unpretending appearance of the little Brâhman, Bali asked him to demand a boon, however costly it might be. The dwarf, however, merely asked for so much ground as he could measure with three paces. The king smilingly granted so modest a request, though his family priest *Us'anas*, suspecting the true nature of the dwarf, strongly dissuaded him from doing so. But when the dwarf had obtained what he asked for, he strode with one pace over the earth, with a second over the intermediate space (the atmosphere), and with a third over the sky, thus leaving for Bali only the subterranean regions, which he assigned him for his future abode. The demons endeavored to frustrate this result, after Vishn'u had taken his first two strides, but they were overcome by the followers of Vishn'u; and Bali, when resigning himself to his fate, in reply to a reproach addressed to him by the dwarf for trying to break his promise, uttered—according to the Bhâgavata-Purân'a—the following words, which may serve as one of many instances to show how sacred a promise was held by the Hindus when once given, and even though artfully obtained: "If, renowned chief of the gods, you consider the word which I uttered to be deceitful, I now do what is sincere, and can be no deception — place your third step on my head. Fallen from my position, I fear not the infernal regions, or binding in bonds, or misfortune difficult to escape, or loss of wealth, or your restraint, so much as I am

afflicted by a bad name." (See J. Muir's *Original Sanskrit Texts*, vol. iv. p. 128.) For his righteousness, he was then rewarded by Vishn'u with the promise, that after a temporary residence in one of the most delightful places of Pâtâla (q.v.), he should be born as the Indra, in the reign of the eighth Manu. In this incarnation as dwarf, Vishn'u is considered to have been a son of the same Kas'yapa who is also the father of Hiran'yakas'ipu and Hiran'yâksha; but while their mother is Diti, the dwarf's mother is Aditi (space); and since she previously had brought forth Indra, Vishn'u is sometimes called Upendra, or the younger or later Indra. As a son of Aditi, Vishn'u becomes one of the Âdityas (see before).—The Vedic conception of the three strides of Vishn'u, as mentioned in the beginning of this article, is doubtless the basis of the idea whence this Avatâra arose.

6. The *Paras'u-Râma-Avatâra*, or Vishnu's incarnation as Râma, the son of Jamadagni, armed with an axe (*paras'u*). *Arjuna*, a son of *Kr'itavîrya*, and king of the Haihayas, had obtained, as a reward for his piety, a thousand arms, and the sovereignty over the earth. The gods, frightened at his power, had recourse to Vishn'u, and the latter resolved to be born as a son of Jamadagni, that he might slay him. Jamadagni was the son of *R'ichîka*, of the race of Bhr'igu, a pious sage who had married *Ren'ukâ*, the daughter of king *Prasenajit*, and had obtained five sons by her, the last of whom was *Râma*, or Vishn'u incarnate in this form. Ren'ukâ having once, for some supposed impropriety, incurred the anger of her husband, was, at his bidding, killed by her son Râma, but at the request of the latter, again restored to life; and her first four sons were likewise saved from the consequence of the wrath of Jamadagni by the intercession of their brother Râma. After this event had happened, or, as one account goes, previously to it, Arjuna came to the hermitage of Jamadagni, and was there hospitably received by the saint, who could treat him and his followers sumptuously, as he possessed a fabulous cow of plenty, that not merely supplied him with the milk and butter required for his sacrificial offerings, but with everything else he wished for. Struck by the precious qualities of this cow, and in spite of the kind treatment he had met with, Arjuna carried off with him the cow and her calf. When Râma, who, on this occasion, had been absent from home, returned to the hermitage, and learned what had happened, he took up his axe (or, as the Mahâbhârata says, his bow), and slew Arjuna, together with his army. The sons of the latter, to revenge their father's death, after some time, attacked the hermitage, and succeeded in killing Jamadagni. Thereupon, Râma made a vow to extirpate the whole Kshattriya or military race; and not satisfied with destroying the sons of Arjuna, he killed every Kshattriya whom he encountered afterward. In this manner, the legend concludes, "he cleared thrice seven times the earth of the Kshattriya caste"—killing the men of so many generations as fast as they grew to adolescence—"and filled with their blood the five large lakes of Samantapanchaka, from which he offered libations to the race of Bhr'igu." He then performed a solemn sacrifice, and distributed the land and many riches among the ministering priests. The Mahâbhârata, which on two occasions relates this legend, in one place enumerates the Kshattriyas who escaped the destruction of their caste, and from whom the lines of the kings hereafter were continued; this account, however, is inconsistent with Purânic lists, in which the royal lineages are uninterrupted. There can be little doubt that a real historical conflict between the Brâhman'as and Kshattriyas underlies the conception of this Avatâra; one which has its parallel in the history of Vasisht'ha and Vis'wâmitra (q.v.).

7. The *Râmachandra-* or, briefly, *Râma-Avatâra.—Râvan'a*, a king of *Lankâ*, or Ceylon, a monster with ten heads and twenty arms, had, by dint of austerities, obtained from Brahman the promise that neither gods nor demons should be able to take his life. In consequence, he oppressed the whole universe: the sun dared not shine hot, or the fire burn, or the wind blow, where he stood, and the ocean, when it saw him, became motionless. The gods, thus seeing the world and their own existence endangered, implored Brahman to protect them; and he, remembering that the demon, when asking for the boon he had granted him, omitting to include men among the beings that should not hurt him, advised the gods to pray to Vishn'u to become incarnate. This they did, and Vishn'u granted their prayer. At that time, *Das'aratha*, a king of Ayodhyâ, of the solar line of Hindu kings, performed the great horse-sacrifice in order to obtain sons; for though he had three wives, *Kaus'alyâ*, *Sumitrâ*, and *Kaikeyî*, he was without male progeny. This sacrifice became successful, for, when on the point of completion, a supernatural being appeared to him with a divine beverage, one-half of which he was to give to Kaus'alyâ, one-fourth to Sumitrâ, and the remaining fourth to Kaikeyî. And as this nectar which he gave them contained the divine essence of Vishn'u, *Râma*, the son whom Kaus'alyâ brought forth, became one half, the twins *Lakshman'a*, and *S'atrughna*, born by Sumitrâ, together one-fourth, and *Bharata*, the son of Kaikeyî, another fourth, of the substance of Vishn'u. While Râma and his brothers were still boys, the sage *Vis'wâmitra* (q.v.) came to the court of Das'aratha, requesting him that he should allow Râma to proceed to his hermitage, in order to destroy there the Râkshasas, or fiends, who infested it, and disturbed his sacrificial rites. Though reluctantly, Das'aratha gave his consent to his departure; and Râma accompanied by his brother Lakshman'a—who, throughout his brother's career, ramained his faithful companion and ally—started on his first eventful journey; for it was marked by a number of won

derful exploits which he performed in killing the demons and which already then revealed his divine mission. Having fulfilled the desire of Viswâmitra, he proceeded to Mithilâ, where king *Janaka* held a great assembly of kings, having promised to give in marriage his daughter *Sîtâ* (q.v.) to the prince who would be able to bend the bow with which S'iva (q.v.) once conquered the gods at the sacrifice of Daksha, and which now was in his trust. Yet so large and heavy was this bow, that not even the strongest of them could so much as move it. But when Râma arrived, and the bow was shown him, he lifted it up and bent it, as it were in sport, and ultimately even broke it in the middle. Sîtâ became thus the wife of Râma; while Janaka gave *Urmilâ* to Lakshman'a, *Mân'd'avî* to Bharata, and *S'rutakîrtti* to S'atrughna. On his way home, Râma met *Paras'urâma* (see the sixth Avatâra) who, having heard of his namesake's bow-feat at the court of Janaka, challenged him to bend also the bow of Vishn'u, which he had received from his father, Jamadagni, and if he could do so, to a single combat. Râma, displeased with the doubt of Paras'urâma in his strength, immediately seized the bow, bent it, and would have killed the son of Jamadagni, had he not respected his quality as a Brâhman: still, he destroyed the worlds which the latter had acquired by his penance, and thus excluded him from heaven. (This account given of the meeting of the two Râmas, in the Râmâyan'a, would seem to show that at the time when this poem was composed, the *Paras'urâma* was not yet conceived as an incarnation of Vishn'u, since he is represented in it as jealous of the defeat which S'iva's bow had suffered at the hands of the son of Das'aratha.) After this event, Bharata, and his brother S'atrughna, were sent by their father on a visit to Bharata's maternal uncle, *As'wapati;* and Das'aratha, who was old, and desired to retire from the world, made all preparations for installing his eldest son, Râma, as heir-apparent to the throne of Ayodhyâ. But in this design he was frustrated; for, through the intrigues of *Manthará*, the hunchbacked nurse of Bharata, and his queen Kaikeyî, he was, in a weak moment, prevailed upon to grant any wish which the latter would ask of him; and Kaikeyî, availing himself of Das'aratha's rashly-given promise, demanded of him the installation of her own son, Bharata, as heir-apparent, and the banishment to the forest of Râma for a period of 14 years. A promise once uttered being irrevocable, and Râma having resolved not to cause a word given by his father to remain vain, neither the wishes of the people of Ayodhyâ nor those of Bharata and S'atrughna, who meanwhile had returned, and were enraged at what had occurred, could shake his determination to submit to his exile. Das'aratha died in consequence heart-broken, and Bharata assumed, till the return of Râma, the government of Ayodhyâ.

The long exile of Râma which now followed, and was shared in by his brother Lakshman'a, became, then, the source of the wonderful events which should hereafter lead to the destruction of the demon Râvan'a. They began with a series of conflicts which he had to sustain with the Râkshasas, who infested his forest abode, and which invariably, of course, ended in the destruction of these beings. One of these conflicts, however, was especially pregnant with the destiny he had come to fulfill. Râvan'a's sister, *S'ûrpan'akhá* (lit., a female whose finger-nails were like winnowing baskets), was one of those demons who haunted the woods. She fell in love with Râma, but was repelled by him; and when, in a fit of jealousy, she attacked Sîtâ, Lakshman'a cut off her ears and nose. Enraged at this treatment, she repaired to her brother Râvan'a, and in order better to stimulate his revenge, she also excited in him a passion for Sîtâ. Râvan'a therefore started off for the forest Dan'd'aka, where Râma lived; and, aided by another demon, Marîcha, who transformed himself into a golden-colored deer, and thus enticed both brothers away from the hermitage, to chase after it, succeeded in carrying off Sîtâ to his capital. By means of some other supernatural events then happening, Râma discovered the fate of his wife; and the remainder of his exile is now filled up with his preparing for war with Râvan'a, conquering and destroying him, and recovering Sîtâ, whose honor had remained untarnished during her long and severe trials when kept as a prisoner in the harem of Râvan'a. Some of the incidents of this struggle are of special interest, inasmuch as they are the basis of traditions still prevalent in India. They chiefly relate to the allies of Râma, who were no other than miraculous bears and monkeys, and by their magic powers mainly brought about the defeat of Râvan'a and his armies, while also helping him to communicate with Sîtâ during her captivity. All these bears and monkeys were of divine origin, produced at the behest of Brahman by the gods for the express purpose of becoming the allies of Râma. Thus, the bear-king, *Jámbuvat*, issued from the mouth of Brahman himself; *Bâli* was a son of Indra; *Sugríva*, of the Sun; *Tára*, of Vr'ihaspati; *Gandhamâdana*, of Kuvera; *Nala*, of Vis'wakarman; *Nîla*, of Fire; *Sushen'a*, of Varun'a; *S'arabha*, of Parjanya; and the most renowned of all, *Hanumat*, was a son of Wind. See the article HANUMÂN, where several of his feats are mentioned. They overbridged the sea, to carry their armies to Ceylon—whence the line of rocks in the channel is still called *Râmasetu*, or Râma's bridge—in the English maps, Adam's bridge; they brought large rocks from the Himâlaya to support the bridge—whence the numerous rocks scattered all over India are supposed to have arisen as they dropped down on their transport to the sea; and they performed similar other feats, still commemorated in festivals performed in honor of Hanumat and his tribe. As is the case in other Avatâras of Vishn'u, there is also in the Râma-Avatâra a personage who, though nearly related to the fiend doomed to destruc-

tion, acknowledges the divine nature of the incarnate god, and dissuades his friends from opposing him. In this Avatâra, such a personage is *Vibhishaṇ'a*, the uncle of Râvaṇ'a, whose counsel, however, is disregarded. Similarly disposed is also *Kumbhakarṇ'a*, the brother of Râvaṇ'a, who likewise understands that Râma is Vishṇ'u; but, as he yields to the orders of his brother, his fate is death. Vibhîshaṇ'a, however, in reward of his proper conduct, is, after Râvaṇ'a's death, placed on the throne of Ceylon. When, at the end of this fierce war, the time fixed for Râma's exile had expired, he returned to Ayodhyâ with Sitâ, whose purity had previously been tested by an ordeal of fire, and there received back from Bharata the sovereign power which, in the mean time, the latter had exercised in his stead; and at the end of a long and glorious reign, he became reunited with the splendor of Vishṇ'u. The story of this incarnation is briefly told in an episode of the Mahâbhârata (q.v.), and in several Purâṇ'as; with the fullest detail, however, in the *Râmâyaṇ'a* (q.v.). A copious abstract of the latter is given in the poem *Bhaṭṭ'ikâvya*. See SANSKRIT LITERATURE. The English reader may consult, for some further detail, an "Analysis of the Râmâyaṇ'a," in Prof. Monier Williams's *Indian Epic Poetry* (Lond. 1863).

8. The *Kṛ'ishṇ'a-Avatâra* and *Balarâma-Avatâra*.—The former of these two, which are generally treated as one, is the most interesting incarnation of Vishṇ'u, both on account of the opportunity which it affords to trace, in Hindu antiquity, the gradual transformation of mortal heroes into representatives of a god; and on account of the numerous legends connected with it, as well as the influence which it exercised on the Vaishṇ'ava cult (see VAISHṆ'AVAS). In the Mahâbhârata (as Dr. Muir has shown in the fourth volume of his excellent work, *Original Sanskrit Texts*), Kṛ'ishṇ'a—which literally means, "the black or dark one"—is sometimes represented as rendering homage to S'iva (q.v.), and therefore acknowledging his own inferiority to that deity, or as recommending the worship of Umâ (q.v.), the consort of S'iva, and as receiving boons from both these deities. In some passages, again, he bears merely the character of a hero endowed with extraordinary powers, and, in some, his divine nature is even disputed or denied by his adversaries, though they are ultimately punished for this unbelief. As the intimate ally of the Pâṇ'du prince, Arjuna (see PÂṆ'DAVAS), he claims, especially in the philosophical episode, the Bhagavadgîtâ, the rank of the supreme deity; but there are other passages, again, in the Mahâbhârata, in which the same claim of S'iva is admitted, and an attempt is made at compromising their rival claims by declaring both deities one and the same. Sometimes, moreover, Kṛ'ishṇ'a is, in this epos, declared to represent merely a very small portion—"a portion of a portion," as it is called—of the divine essence of Vishṇ'u. In the Mahâbhârata, therefore, which is silent also regarding many adventures in Kṛ'ishṇ'a's life, fully detailed in the Purâṇ'as, the worship of Vishṇ'u in this incarnation was by no means so generally admitted or settled as it is in many Purâṇ'as of the Vishṇ'uit sect; nor was there, at the epic period, that consistency in the conception of a Kṛ'ishṇ'a-Avatâra which is traceable in the later works. The principal legends relating to Kṛ'ishṇ'a, as he appears in the Harivaṃs'a and the Purâṇ'as, are the following: A demon king, *Kansa* of Mathurâ, of the race of Yadu, and therefore of the lunar line of kings, who, in a former birth, had been the demon *Kâlanemi*, had deposed and imprisoned his father, *Ugrasena*, and oppressed, with his iniquitous hosts, the Earth; and Earth having laid her complaints before an assembly of the gods on Mt. Meru, Brahman prayed to Vishṇ'u to relieve the world of its distress. When he had ended his prayer, Vishṇ'u plucked off two hairs, one white, and one black, and promised the gods that these two hairs should become impersonated as *Balarâma* and *Kṛ'ishṇ'a*, sons of Devakî, to fulfill their wishes. Now Devakî, who, in a former life, had been Aditi (space personified), was a wife of Vasudeva, who was of the race of Yadu, and a relative of Kansa; but as Kansa had been warned by a voice in heaven that their eighth child would be an incarnation of Vishṇ'u, he placed both husband and wife in confinement, after having obtained, though, from Vasudeva the promise that he would deliver to him every child Devakî would bring forth. Six children of hers were accordingly given up to Kansa, and destroyed; but when Balarâma, the seventh, was about to come into the world, Vishṇ'u appeared to *Yoganidrâ*, a form of Umâ (q.v.), and directed her to transfer Balarâma, before the time of his birth, to *Rohiṇ'î*, another wife of Vasudeva, and spread the report that Devakî had miscarried; enjoining her also to become incarnate as a child of Yas'odâ, the wife of an old cowherd Nanda, at the same time that he would become incarnate, as Kṛ'ishṇ'a, in the eighth conception of Devakî; for at the time of their simultaneous birth, he added, Vasudeva, aided by him, would bring the infant Kṛ'ishṇ'a to the bed of Yas'odâ, and her to that of Devakî. In this manner, *Balarâma* and *Kṛ'ishṇ'a* were saved, though the infant Durgâ, as soon as born, was dashed by Kansa against a stone, and suffered a temporary death. Kansa, having become aware that his design had been frustrated, now ordered the destruction of all young children, wherever they might be found, but considering it useless to keep Devakî and Vasudeva any longer in prison, liberated them. Vasudeva, apprehensive of the safety of Balarâma, then took him to Nanda, to be brought up together with Kṛ'ishṇ'a; and thus began the earthly career of these two Avatâras of Vishṇ'u, in which Balarâma always figures as the friend and ally of his more important brother, Kṛ'ishṇ'a. The first miraculous act of the latter consisted in causing the death of a female demon, *Putanâ*, who suckled, and meant to destroy him. Then, as a little boy, he overturned a heavy wagon of the cowherds,

and pulled down the trunks of two large trees—to the amazement of the cowherds, who did not yet suspect his divine nature, and, becoming afraid to remain any longer in Vraja, the place where these events happened, repaired to Vr'indâvan'a. There Balarâma and Kr'ishn'a remained until they had attained seven years of age. At this time Kr'ishn'a killed a serpent-monster Kâlîya, in the Yamunâ river, and then returned to Vraja. The next exploit of the brothers, more particularly, however, of Balarâma, consisted in the destruction of two demons, *Dhenuka* and *Pralamba*, who infested the forests; but that which followed, especially established the fame of Kr'ishn'a, and is one still commemorated in their festivals by the worshipers of this god. When sporting in Vraja, he once found all the cowherds busily engaged in preparing for a sacrifice to be offered to Indra (q.v.). Seeing this, he dissuaded them from worshiping this god, and directed them to address their prayers and offerings to the mountain *Govardhana*. Indra, however, offended by these proceedings, sent a heavy storm, which inundated the country, and threatened to destroy the cattle. Thereupon, Kr'ishn'a plucked up the mountain Govardhana from its base, and held it up as a large umbrella over the cow-pens, to shelter the herdsmen and their cattle from the storm. For seven days and nights they were thus protected by the elevation of the mountain; and Indra, at last convinced of the irresistible might of Kr'ishn'a, came to Govardhana, and worshiped him, obtaining on this occasion the promise that Kr'ishn'a would befriend the Pân'd'u prince, Arjuna, in his conflict with the Kurus (see MAHÂBHÂRATA). The episode in the life of Kr'ishn'a which now ensued, and is filled up with the pleasures and sports he enjoyed among the Gopîs, or cowherdesses, is that commemorated in the Râsa Yâtrâ, an annual festival celebrated in various parts of India in the month of Kârttika (Oct.–Nov.), and dwelt upon in many poetical works. Of these cowherdesses, later poets especially mention *Râdhâ;* and she is sometimes also represented as the divine or mystical love to which Kr'ishn'a returns at the end of his more worldly amours (see the article JAYADEVA). After some more miraculous deeds, Kr'ishn'a and Balarâma repaired to Mathurâ, where Kansa, in the hope of affecting their death, had invited them to assist at a solemn rite of the lustration of arms, and to engage in a trial of strength with his chief boxers, *Chân'ûra* and *Mushţ'ika*. *Akrûra*, sent by Kansa to convey to them his invitation, had already revealed to them the purpose for which he was despatched; but undaunted by his words, they accomplished their journey, during which they performed several other wonderful deeds, and, arrived at Mathurâ, accepted the challenge of Kansa. The contest ended not only in the death of the two boxers, but in that of Kansa also. Kr'ishn'a now released *Ugrasena*, Kansa's father, from the confinement in which he was kept, and restored him to the throne of Mathurâ. A number of other miraculous feats now followed in the career of Kr'ishn'a. The principal are his conquering *Jarâsandha*, the father-in-law of Kansa, who came to revenge the death of the latter, and *Kâlayavana*, a king of the Yavanas, who also overran Mathurâ with his armies; and his founding the city of Dwârakâ. At the end of these wars, he made a short stay at Vraja, then returned to Dwârakâ, and there married Revatî, by whom he had two sons. But he also carried off violently *Rukmin'i*, the daughter of a king of Vidarbha, who had been betrothed to *S'is'upâla* (q.v.), and had to wage a hot contest with the latter and his allies, before he conquered them. His next war was that with *Naraka*, a demon-king of Prâgjyotisha, who had robbed Aditi of her earrings, and ultimately was put to death by him. He then repaired to Indra's heaven, to restore to Aditi her earrings; but carrying off a wonderful tree from Indra's garden, got into a conflict with this god; ultimately, however, he was allowed by him to take the tree to Dwârakâ. There he married 16,100 maidens, whom he had rescued from Naraka. Other wars followed, in one of which Kr'ishn'a also fought with S'iva, when siding with his enemy Bân'a, who was a son of Bali. The most important, however, of all these contests is the great war between the Kurus and Pân'd'us, in which Kr'ishn'a was the ally of the latter. According to the *Vishn'u-Purân'a*, Kr'ishn'a's earthly career was brought to its close by an event which has nothing in it of the miraculous, and is more consistent with the end of a mortal hero than with that of an incarnate god. He was accidentally shot in the sole by a hunter, who thought that he was aiming at a deer. The hunter, it is true, is called *Jarâ*, which is a word in the feminine gender, and means "old age," or "decay;" but even if a mere allegory, the story of his end "from old age," or an arrow, barely tallies with the character assigned him in the Purân'as, and is therefore sometimes also omitted in the accounts of this Avatâra.—For Balarâma, see also the legend in the article YAMUNÂ.

9. The *Buddha-Avatâra*, or Vishnu's epiphany as Buddha.—It is originally foreign to the cycle of the Avatâras of Vishn'u, and therefore only briefly alluded to in some Purân'as. Where this is done, the intention must have been to effect a compromise between Brahmaism and Buddhism, by trying to represent the latter religion as not irreconcilably antagonistic to the former. See BUDDHISM.

10. The *Kalki-* or *Kalkin-Avatâra*.—It is yet to come, "when the practices taught by the Vedas and the institutes of the law, shall have ceased, and the close of the Kali or present age shall be nigh." Vishn'u will then be born "in the family of *Vishn'uyas'as* (possessing the glory of Vishn'u), an eminent Brahman of Sambhala village, endowed with the eight superhuman faculties. He will then destroy all the barbarians and thieves, and all whose minds are devoted to iniquity."—*Vishn'u-Purân'a*.

Vishn'u's wife is *S'rî*, or *Lakshmî* (q.v.), and his paradise *Vaikunţ'ha*. When repre-

sented, he is of a dark hue, with four hands, in which he holds a conch-shell, blown in battle, the *Pinchajanya;* a disk, the *Sudars'ana,* an emblem of sovereign power; a mace, the *Kaumodakî,* as a symbol of punishment; and either a lotus, as a type of creative power, or a sword, the *Nandaka.* On his breast shines the jewel *Kaustubha.* He is variously represented: sometimes, as *Nârâyan'a* * (see the first Avatâra), when floating on the primeval waters, and resting on *S'esha,* his serpent of infinity—the god Brahman coming out of a lotus that arises from his navel, and Lakshmî being seated at his feet; or riding on *Garud'a,* a being half bird and half man, or seated on a throne, and holding Lakshmî on his lap; or, if he is represented in one of his incarnate forms, as fish, boar, man-lion, etc., he has a human shape, ending in a fish, or a human body with a boar's head, or with a lion's head; or he appears as a dwarf, or (as Paras'urâma) armed with an axe; or (as Balarâma) holding a plow-share. As Kr'ishn'a, he is generally represented in a juvenile form, or as an adult, in a dancing posture, and playing on the flute. As Kalki, he has a sword in his hand, and is kneeling before a winged horse. The leading personages or events connected with these Avatâras are likewise frequently associated with the representation of the god: thus, in the representation of the fourth Avatâra, Hiran'yakas'ipu, as being torn open by the man-lion; or, in that of the sixth, the demon Arjuna, fighting with Paras'urâma; or, in that of the seventh, the ten-headed Râvan'a, battling with Râmachandra; or Hanumat and the monkey chiefs, paying adoration to the latter; while his brothers stand at his sides, and Sitâ is sitting on his lap; or, in the eighth Avatâra, the mountain Govardhana, when uplifted by Kr'ishn'a, and the Gopîs sporting with him. Vishn'u is praised under thousand names, which are enumerated in the *Mahâbhârata,* and have been commented upon by S'ankara, and other authors.—For other myths relating to Vishn'u, the general reader may consult H. H. Wilson's translation of the *Vishn'u-Purân'a,* which has been recently re-edited by Fitz-Edward Hall (five volumes, with index, Lond., 1864–76); the first nine books of *Le Bhâgavata-Purân'a, traduit et publié par Eugène Burnouf,* vols. i.–iii. (Paris, 1840–47); *Harivans'a,* traduit par A. Langlois, vols. i., ii. (Paris, 1834–35); Lassen's *Indische Alterthumskunde,* vol. i. (2d edition, Leipzig, 1866), vols. ii.–iv. (Bonn and Leipzig, 1852–61); and the first and fourth volumes of John Muir's *Original Sanscrit Texts* (Lond. 1858, 63); *Institutes of V.* translated by Jolly in the *Sacred Books of the East* series.

VISHN'U-PURÂN'A. See PURÂN'A.

VISIBLE SPEECH, a system of alphabetic characters, each of which represents the configuration of the mouth which produces the sound. The system is the invention of Mr. Melville Bell—the well-known elocutionist, formerly professor of elocution in University college, London—and was published in 1867, under the title of *Visible Speech* (Trübner). Mr. Bell has since published a short shilling work—*English Visible Speech for the Million* (Trübner), which is quite enough to give a general idea of the system.

Mr. Bell, believing his system to be practically, as well as theoretically, perfect, was anxious to bring it into general use at once, and accordingly made a very generous offer to relinquish all his rights if the expense of casting the new types and publishing the theory of visible speech were defrayed by the government. The proposal was rejected, and Mr. Bell was compelled to publish his system as an ordinary copyright.

Now that the system has been thoroughly tested by the very few who are competent to do so, we are able to give a definite and impartial opinion on its merits, and to say that the absolute perfection that Mr. Bell artributed to it does not exist—that the analysis of sound-formation on which it is based is, in some instances, imperfect or erroneous, and that the symbols might, in many cases, be improved, even where there is no fundamental error of analysis to correct. The chief defects in Mr. Bell's analysis of speech-sounds are: (1) his ignorance of the latest results of German investigations of the mechanism of the throat sounds (whisper, the Arabic gutturals, etc.); (2) his imperfect knowledge of the *synthesis* of sounds, syllabification, word-division, etc.; (3) errors of detail, especially in the consonants, such as his including *f* under the same category as *l* ("divided" consonants), and his analysis of *th.* Other points are still doubtful, and it is certain that, as our knowledge advances, many other difficulties will appear. But it is none the less true that our very knowledge of these defects is due to the vantage-ground on which visible speech has itself placed us. It was an immense advance upon any phonological analysis previously attempted, and opened up once for all the way to arrive at definite results. It was, in short, a *new instrument* placed in the hand of the student of phonetics, and it must, it is clear, for many years to come, continue to be a purely scientific instrument. When finally perfected there can be no doubt that it will come into general use, and finally supersede the present system.

Apart from the question of absolute perfection, we cannot refuse Mr. Bell's analysis our profound admiration as a great work of genius. Unaided by the resources of the German physiologists, he has completely beaten them on their own ground: where they, with all the resources of the laboratory at their command, have painfully collected a few isolated observations, he has erected a splendid edifice. And it is precisely where they utterly break down—namely, in the analysis of the vowels—that his genius shines most

* "The waters are called *nâra,* because they were the production of *nara* (or the supreme spirit); and since they were his first *ayana* (or place of rest, when in the form of the god Brahman), he thence is named *Nârâyan'a* (or resting on the waters)."—*Manu,* i. 10.

brightly. By his discoveries of the distinction of "narrow" and "primary," of the "mixed" vowels, intermediate between the guttural and palatal ones, and of the compound character of the labial vowels, Mr. Bell has been able to select from the enormous number of shades of vowel-sound (for every movement of the tongue produces a new sound), certain definite formations, thirty-six in number, all definitely correlated, which include, with the various intermediate formations, all possible simple vowel sounds.

The system of notation is not less a work of genius than the physiological analysis on which it is based. All the letters are formed by the combination of about thirty radical symbols, most of which are, to a certain extent, pictorial of the action of the organs which produce the sound. Thus a simple circle O represents breath issuing from the *open* throat (aspiration); while the *narrowing* of the glottis which produces vocal murmur is symbolized by I, from which, by modifiers to indicate guttural, palatal, "primary," "wide," etc., all the vowel symbols are formed. Contraction in the mouth is indicated by a C, and the *part* of the mouth in which the contraction takes place is shown by the direction in which the symbol is turned— thus, C denotes contraction in the *back* of the mouth (Scotch and German *ch* in *loch*), Ↄ denotes lip-contraction. Complete stoppage is indicated by drawing a line across the opening, giving a symbol resembling D, which turned this way would represent the sound of *p*, while ᗡ would represent *k*. The symbols for vocality, nasality, etc., are similarly incorporated into the consonant symbols. This will be enough to show the two chief features of the system: (1) its simplicity and perfect consistency; and (2) the correlation of the symbols. Thus, when the student has learned to recognize the symbol for *m* as differing from *b* only in the addition of the sign for emission through the nose, he is at once able to recognize and form for himself the symbols of *ng* and *n*, if he is already acquainted with those of *g* and *d*. Such a system is evidently of the highest value in all philological investigations which involve the study of sound-changes in different languages. It has been found that many phenomena of language, such as "umlaut," which, when formulated in the ordinary Roman type, require a long technical exposition to be made intelligible, explain themselves at once without further comment when transliterated into the visible speech symbols. It is from the use of visible speech by scientific philologists that we hope most, both for the progress of phonetics and general philology, and also for the improvement and ultimate practical application of visible speech itself. A striking example is afforded by Dr. J. A. H. Murray's admirable work on the *Southern Dialects of Scotland*, in which the phonetic portion owes its clearness and exactness mainly to the use of visible speech. It has also been employed by Mr. H. Sweet in his *History of English Sounds*. Mr. A. J. Ellis, lastly, the father of scientific phonology in England, although employing a system of his own, refers constantly to visible speech, to establish the absolute value of his symbols.

The practical applications of the systems to the acquirement of the pronunciation of foreign languages, to telegraphy, to the instruction of the deaf and dumb (for which it is already largely employed in America), and to general elocutionary purposes, are self-evident. It is clear that visible speech has a brilliant future before it, and it is the duty of all interested in the advancement of science and education to do all they can to disseminate a knowledge of it among all classes. See Deaf and Dumb.

VISIGOTHS. See Goths.

VISION, the act of seeing; that faculty of the mind by means of which, through its appropriate material organ, the eye (q.v.), we are percipient of the visible appearances of the external world. Considered in the latter signification, vision includes questions of high importance in relation to some of the most intricate problems of philosophy; as this part of the subject has already been discussed under Perception, the present article will be restricted, as far as possible, to an exposition of the phenomena and laws of vision proper. In opposition to the bulk of mankind, who believe undoubtingly that they actually *see* the externality and solidity of the bodies around them, bishop Berkeley maintained that these properties are not the immediate objects of sight at all, but are simply ideas derived originally from the touch, and erroneously attributed to vision, in consequence of their having been uniformly experienced concurrently with certain "visible signs" (as, for example, color), with which alone the sense of sight is truly conversant; and this theory of vision having since received the adhesion of a great majority of the most able metaphysicians, it will be proper to give an outline of its leading propositions. In doing this, we shall at the same time intersperse such remarks and counter-statements as may appear to be rendered necessary by the progress of opinion and the results of modern experimental inquiry. First, as to the externality, or outness of objects; or, which is the same thing, their distance from the eye. This, Berkeley maintains, cannot of itself and immediately be seen. "For distance being a line directed end-wise to the eye, it projects only one point in the fund of the eye; which point remains invariably the same, whether the distance be longer or shorter." To this position, everywhere assumed by Berkeley to be indisputable, and by his followers admitted to be so, it may be objected, that it contains an unwarranted assumption, viz., that a ray of light is, by its very nature, incompetent to convey an impression indicative of its possessing length or extension; or, to speak more accurately, it assumes that "apparent distance" is not at all affected by a variation in the actual length of the ray intervening

between the eye and the object. Yet it seems obvious, that the facts of vision do not admit of our arguing the matter, as though the line extending from any point of an object to the eye were a mere mathematical abstraction. Every visible point sends forth diverging rays, which form a cone whose base is on the pupil of the eye; and to the eye the place of this visible point is at the intersection, real or virtual, of the rays in question: real, when the radiant point is viewed directly; virtual, when the rays, either by refraction or reflection, are diverted from their original path before reaching the eye. To take a case of refraction: if we notice the distance of a shilling lying at the bottom of an empty vessel, we shall observe, upon filling the latter with water, a manifest diminution in the apparent distance of the shilling, the reason being that the rays, on their emergence from the water, are bent outward, so that the point of their virtual intersection is brought nearer to the eye. In reflection, the place of a visible point is, in like manner, referred to the point of virtual intersection of the cone of rays incident upon the pupil; and by multiplied reflections, the apparent distance of a point actually adjacent to the eye, may be increased to an almost indefinite degree. It is forcibly contended by Berkeley that these facts, involving, as they do, geometrical considerations known only to few, and by none consciously realized in the act of vision, cannot be concerned in our appreciation of distance by the visive faculty. Yet these, and numberless similar experiments, render it evident that both "apparent distance" and "apparent place" are closely dependent upon these geometrical conditions; and, therefore, without assuming that vision is performed by the aid of connate or instinctive geometry (a notion justly condemned by Berkeley), it yet seems highly probable that these lines and angles are the exponents and invariable concomitants of an actual operation of light upon the eye, specific in its character, and by reason of its necessarily varying, *pari passú*, with every change in the distance of the point of intersection of the visual rays, fitted to convey to us an intuitive perception of varying distance.

In the article EYE (q.v.), it has been shown (as, indeed, necessarily follows from optical principles) that the eye does actually undergo specific modifications, depending for their amount on the distance of the object; and there therefore seems an intrinsic probability that these distantial variations in the organ of sight are correlated to those facts of our consciousness which we denominate variations of visible (not tangible) distance; and as, furthermore, it may be demonstrated by optical experiments that the "apparent distance" of a visible point is directly modified, to our perception, by a simple change in the mutual inclination of its diverging rays, it seems an inevitable conclusion, that that agency of light which suggests to our minds differences of distance is competent to suggest distance itself.

Berkeley was quite aware of the necessary connection which subsists between the distance of an object and the divergency of the rays it emits, though it may be doubted whether he adequately weighed the importance of the train of consequences evoked within the eye itself by this variable divergency of incidence; but he affirms that the mind is not by these means helped to a conception of distance except in so far as by experience we have found that increased divergency, carried to the extent of producing "confused vision," is constantly associated with diminished distance. And in proof that this association is merely accidental, Berkeley cites a curious optical experiment, which shows that where the incident rays are caused slightly to converge, instead of their suggesting, as one would be led to expect, that the object is at an enormous distance, the result is altogether different; viz., at first, when the eye is close to the lens, and vision distinct, the object is seen at its true distance, but afterward, as the eye is gradually withdrawn, and vision becomes continually more "confused," the object appears to be enlarged in all its dimensions, and to approach nearer and nearer, until it vanishes in mere confusion from the view. "This phenomenon," he says, "entirely subverts the opinion of those who will have us judge of distance by lines and angles, on which supposition it is altogether inexplicable." To which it may be replied, that the hypothesis being that the mind judges (mediately) by "the various divergency of rays," it cannot fairly be tested by experimenting with rays that are convergent, and that necessarily produce conditions of vision the reverse of those normally prevalent. But, besides, it is now certain that the explanation given by Berkeley is not the true one; for it has been shown, by Prof. Wheatstone, that when the dimensions of a retinal picture are continuously increased (as is the case in the above experiment), the object appears to approach in the most evident manner.

From the doctrine of Berkeley, that the sight is not immediately perceptive of distance, it necessarily follows that the parts of a solid object will not be seen as some of them more remote than others, but as if situated all in one and the same plane. This opinion has accordingly been maintained by more recent writers; yet its unsoundness seems manifest; for, if objects be originally seen, not as solid objects, but as perspective representations on a plane, then this plane must be seen either at no distance (which is absurd), or at the same distance for all objects (for which no reason and no evidence can be assigned); or at distances varying with the distances of the objects; but as the last two and only tenable suppositions assume the visual perception of distance, which is the very principle sought to be invalidated, the theory is thus shown to be futile and self-contradictory. If it be admitted that, by the constitution of the organ of sight in relation to light, we are perceptive of distance at all, it is in the highest degree proba-

ble, judging not only from analogy, but from the proved distantial affections of the eye, that we perceive by the sight degrees of distance; and a perception of the latter implies, it has been shown, a perception of trinal dimensions. Now, although it is strenuously maintained by the adherents of Berkeley that this is not a primitive attribute of vision, it is not denied by any, that in the exercise of our mature sight, we do undoubtedly perceive the outness, the distance, and the trinal extension of visible objects; but, say they, these very qualities, not being modifications of light or colors, are only in appearance directly perceived by the eye; they are, in fact, the product of tactual experience, but by long and invariable association with the phenomena proper to sight, are now instantaneously suggested by them, in a manner so intimate that the two sets of perceptions have become, to our consciousness, indissolubly one. This, in effect, is to affirm that we cannot see an object to be possessed of trinal dimensions, until its occupancy of space is assured to us by the touch; whereas, we venture to maintain, that we see objects to occupy space, and that what we owe to experience is a knowledge that the major part of these visible appearances have, underlying them, that which, on our making a proper disposition of our bodies, will produce in us tactual sensations. We advisedly say the major part, because there are many objects in nature, such, for instance, as wreaths of smoke and vapor, which, though to the sight visibly possessed of trinal dimensions, are totally imperceptible to the touch. And this suggests the remark, that a great diversity of opinion has arisen out of the ambiguous meaning of the word "solidity," by which those who agree with Berkeley always signify, not mere occupancy of space, which, as we have shown, may be associated with a total absence of tangible qualities, but "resistant extension" in three dimensions, which, beyond all doubt, is solely cognizable by the touch. It is, of course, in the former sense alone that we vindicate to the sight an immediate perception of "solidity;" and we do not use the term "occupancy of space" at all in the sense of mechanical exclusion, an idea manifestly derived from touch, but only as affirming the immediately perceived trinal extension of visible objects. It may also be here remarked, that there are many substances of extreme hardness, and therefore in the highest degree perceptible to the touch, which, though set in a strong light, remain quite invisible; as, for example, the sheets of plate-glass used by Prof. Pepper in producing his "ghost-illusions." Indeed, strictly speaking, all *perfectly* transparent substances, and all *perfectly* reflecting (polished) surfaces, are invisible. Again, there are many appearances in nature, into our perception of which there enters no element of tactual experience, even as it respects variety of surface (color, of course, being excluded from this consideration); as, for example, the waves of the sea, spread out in long undulating lines, or breaking in foam upon the shore; and all those objects which, by their minuteness and the delicate diversifications of their shape and outline, elude the cognizance of the touch. These facts are adduced simply to illustrate the complete distinction and independence which subsists between the two sets of sensations, originating, respectively, with the sight and the touch—a point strongly enforced by Berkeley himself, who did not hesitate to affirm, not only that our habit of referring the two sets of sensations to the same objects is the mere effect of our having experienced them together, but that the two sets of ideas thus "intromitted into the mind" belong, in fact, to two classes of objects, numerically distinct —the one outward, distant, and tangible; the other visible, but at no distance, and therefore, in reality, contained within the mind itself. But, as has been well pointed out by Mr. Bailey, this very distinction, taken in conjunction with the undoubted fact, that we do in maturity apprehend by the sight the distance of visible objects, furnishes a strong presumption that those perceptions cannot have belonged originally to the touch. How little tactual sensations are able to modify visual perceptions is exemplified (as Mr. Bailey remarks) by the fact, that "a straight stick, with one end placed in a basin of water, would still appear to the sight to be bent at that end, after a thousand proofs by the touch that it was otherwise." In the same way, the finger immersed in water appears "unnaturally bent, though the experimenter feels it to be otherwise."

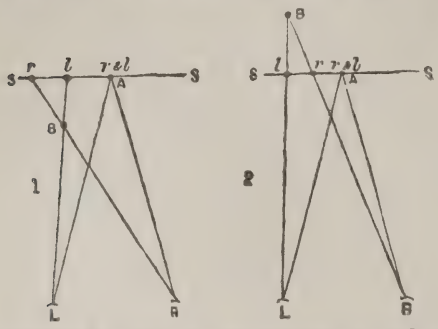
The nature of "visible" or "apparent distance," and how it compares with "real distance," we shall consider when we come to speak of apparent, as contrasted with real magnitude. But we will first inquire what are the optical conditions within the eye itself which determine our perception of the direction of a visible point. Every such point, as we have before remarked, radiates to the eye a cone of diverging rays, whose base is situated in the pupil of the eye; and these rays being refracted in their passage through the eye, are brought to a focus on the retina, thus forming another cone, the base of which is opposed to that of the incident cone, while its apex coincides with the focal point of the refracted rays. If the point of emission be placed directly before the eye, it will be seen in the direction of the common axis of these two cones; or, in other words, in the optic axis; and the central point in which this axis passes through the common basis of the two cones is called the optical center of the eye. Let us suppose, now, another visible point, a little above the first, but at an equal distance from the eye; this, too, will send forth to the eye diverging rays, which will, in like manner, be refracted to a focus upon the retina at a point a little below the preceding; and the line of visible direction will pass from the point of convergence on the retina through the optical center. Now, it is evident that the rays, by means of which we see a visible point, come to the retina from all possible directions within the limits of the cones they

collectively form. How comes it, then, that we perceive the object only in one determinate direction? The explanation usually given (founded on experiments in which a portion of the cone has been excluded without apparent change in the visible direction) is, that, by the constitution of the sense, upon any point in the retina receiving the apex of a cone of rays, we perceive the object in a right line extending from that point of the retina through the optical center; or, according to others, in a right line perpendicular to the surface of the retina at that point. It will, however, be more consistent with the principle that the incidence of light is accompanied by a positive action, related to its direction as well as to its other properties, if we express the law of visible direction by saying, that upon a multitude of rays from all possible directions falling upon a retinal point, the perceived direction is the mean or resultant of them all; which is just as true an account of the phenomena, and amounts, we think, to something more than a verbal distinction. The optical facts we have thus, in brief, indicated, if followed out with respect to all the visible points forming the objects of sight, render it evident that inverted images of the latter are painted upon the retina and the inquiry is prompted, how these can give rise to erect vision. On reflection it will be seen that an explanation of this old and much debated "paradox of vision," is involved in the preceding statement of the law of visible direction, in whichever way it may be expressed; and, as has been shown by previous writers, the difficulty itself has arisen solely from the assumption, contrary to fact, that we *see* the retinal pictures, whereas, considered as images, they are not even the means, but only the concomitants of that operation of light by which we see. Even this important distinction, however, does not convey the whole truth; and we trust it will not be deemed an unnecessary refinement, if we point out that in a strict sense there is no *image* upon the retina, but only a concourse of rays, which, *to the eye of another person*, will undoubtedly give the perception of an image, but cannot be affirmed to exist, as an image, except in relation to this second observer. It is therefore with this reservation that the term retinal images is here made use of. As a consequence of all the lines of visible direction passing through the center of the eye, it follows that as an object recedes from or approaches the eye, its retinal image becomes proportionally less, or greater; and in like manner, the visible object itself varies in magnitude, under certain limitations, to be presently referred to, with every change in its distance. But as "the magnitude of the object which exists without the mind, continues always invariably the same," it is evident, argues Berkeley, that "whenever we speak of the magnitude of anything, we must mean the tangible magnitude," which alone is measurable by "settled stated lengths." The sense in which this is true, clearly illustrates the nature of magnitude and distance, as apprehended by the sight, in contradistinction to what is called real magnitude and real distance, the product of tactual experience. It must not be understood as imputing to the touch of a superiority in mensurative capacity, but as simply meaning, that by the touch we come to know that the external world is endowed with resistant qualities—such as hardness, impenetrability, and incompressibility—qualities which we cannot conceive as modifiable by our bare visual perception of them; and from this experience accrues our conception of the reality and actuality of the magnitude and distance of objects, accompanied by a belief that the variability of magnitude and distance perceived by the sight is an appearance only, and dependent on conditions solely of a subjective kind. If this be a correct view, we are not forced to deny with Berkeley that the objects of sight are numerically the same as those we are cognizant of by the touch.

We must now pass on to the concluding part of the subject—viz., "single vision with two eyes;" in treating of which we shall have recourse, almost exclusively, to the masterly researches of sir Charles Wheatstone, of whose admirable discoveries in this department of knowledge we have already had occasion to speak in the article STEREOSCOPE (q.v.). It will be obvious to those who have read what is there stated, that the question of single vision with two eyes is naturally divisible into two classes—the first including those cases in which the optic axes are parallel, and the retinal images exactly alike; and the second, those in which the optic axes are convergent, and the retinal images dissimilar. Now, to see an object double is to see it in two different places at the same time; and therefore, if it can be shown that by the law of visible direction an impression upon corresponding points of the two retinæ is necessarily referred to the same place, this will account for our single vision of the object at that spot. And on consideration, it will be plain that this is really what happens when the optic axes are parallel, and the images indentical. But it is also evident that this explanation does not apply to the second class of instances; in which the only visible point which depicts itself on corresponding portions of the two retinæ, is that point to which the optic axes are directed. All other points, whether situated before, beyond, or in the plane of the horopter,* are projected upon non-corresponding points of the retinæ; and as these conditions were presumed to be inconsistent with single vision, it was asserted by Aquilonius that objects are seen single only in the plane of the horopter (it has since, with greater consistency, been said, only at the point of intersection of the optic axes); but

* The horopter is a right line drawn through the point of intersection of the optic axes parallel with a line joining the centers of the eyes; a plane drawn through this right line at right angles to the plane of the optic axes, is called the plane of the horopter.

that this is not true is evinced by our common experience that, without movement of the optic axes, we enjoy a certain limited field of distinct vision. Its complete refutation, however, is involved in the theory of stereoscopic vision, which may be thus explained: Let the optic axis of the right eye (R) and of the left eye (L) be converged on the point A; suppose another point B, slightly to the left, and in advance of A; and then through the point B draw lines from L and R respectively intersecting the plane of the horopter in r and l (see fig.). Now, if two diagrams, SS, be prepared (the one representing l and A, and the other r and A), and these be presented to their appropriate eyes in the stereoscope, with the view of each eye limited to its own picture, the points r and l will be seen as a *single* point, situated not on the paper, but in advance of it, in the point of intersection of the lines of visible direction, indicated in the above construction by *Rr* and *Ll*. If the point B be supposed beyond A, and also to the left of it, the lines drawn from L and R to B will intersect the plane of the horopter in l and r (fig. 2); and stereoscopic pictures SS prepared under these converse conditions will exhibit the points l and r as a single point placed behind A at the point of intersection of the lines drawn from L and R respectively. This simple rule involves, as it seems to us, the true principle of the stereoscope; and it is capable of being applied to the most complicated stereoscopic pictures. For, in a stereogram, let l and r stand for identical parts of the left and right pictures respectively, and suppose the pictures superposed; those parts which, read off laterally from left to right, stand in the order *lr* will recede, and those in the order *rl* will protrude (relatively to those parts of the pictures in which r and l absolutely overlie each other), when the pictures are viewed together in the stereoscope. It appears, then, that vision of the third dimension of space is directly obtained by impressions on non-corresponding retinal points; the proof of this being given in the appearance of solidity experienced in the stereoscope, although perfectly plane representations are alone employed; but it would be an error to suppose that this non-correspondence is without a limit; and the question still remains, to what extent the retinal points affected may be non-correspondent, consistently with single binocular vision. Without attempting to propose any definite solution of this difficult question, it may, we think, be considered as highly probable that this limit is determined by the same law which regulates our distinct vision of objects by means of rays inexactly focussed on the retinæ; for, according to Mr. Abbott, "as long as the rays are contained within the area of one sensitive minimum, the sensation will be that corresponding to the vision of a point;" and "a certain amount of dispersion does not interfere with distinct vision." It seems certain that the double perception which is experienced of the further of two objects, when the optic axes are fixed on the nearer, or *vice versâ*, can only arise when the object, thus doubled, is situated within the angle of the optic axes (whether before or beyond their intersection); for under these circumstances only, the sensitive points affected are not simply non-correspondent, but are utterly diverse, being in fact on different sides of the centers of the retina in the two eyes. That the law of projection of the various points composing the relief of a stereoscopic object is correctly stated above, is strongly corroborated by a curious experiment of sir C. Wheatstone's in which solid objects are placed in the stereoscope, instead of pictures. As, for example, two skeleton cubes, so placed, that when the optic axes converge upon them, identical pictures are depicted on the retinæ; in which case, all appearance of relief vanishes, and a perfectly plane perspective representation of a single cube is alone visible; the reason being, that the lines of visible direction for each point intersect each other, neither before or beyond, but *in* the plane of the horopter, where, accordingly, the object is seen as a perspective projection. The same rule holds when the right and left eye pictures are interchanged, for the pictures being supposed, as before, to overlie one another, the parts *lr* become now *rl;* that is, instead of having their point of intersection beyond the plane of the horopter, they have it before that plane; and this, *mutatis mutandis*, being true of all the parts of the pictures, the stereoscopic resultant is the converse of that which would be perceived but for this abnormal arrangement. In these phenomena, named by sir C. Wheatstone the "conversion of relief," and copiously treated of by him in his various papers, the usual relations of distance also are reversed, the nearer parts being seen as further, while the latter are perceived to be of larger dimensions than the former; and, the same principle being applied to the vision of solid objects by means of an instrument called the pseudoscope (q.v.), also invented by sir C. Wheatstone, they are seen as if turned inside out, and under divers other aspects of a most extraordinary character, some account of which will be found in the article just cited. But, as to many of them, it is proper to mention, that the facility of conversion is found to depend, not on the optical conditions, which, of course, remain invariable, but upon mental conditions, as, for instance, previous famil-



larity or otherwise with the converse forms suggested; in short, upon our previous *visual* experience.

We have not yet considered those cases in which the retinal pictures are identical, and the optic axes convergent. In these, the law is, that the object is seen in the plane of the horopter, as is conclusively proved by a beautiful experiment, suggested by sir D. Brewster. If, while looking at a wall-paper, consisting of a small pattern, contin ually repeated at intervals not exceeding 2½ in. from center to center, we cause the eyes to converge to a point in front of the wall, the paper will appear to advance to that point, and will there be plainly visible, in spite of the contradiction of the touch, which, of course, cannot feel the wall where it is seen; while, on the other hand, the eye can perceive no wall in the place where the touch affirms it to exist. The converse of this experiment, although more difficult to perform, is equally curious and instructive. It has also been shown by sir C. Wheatstone, that if an increasing convergence of the eyes be unaccompanied by its usual concomitant, a corresponding enlargement of the retinal pictures, the object is seen as if continuously diminished in all its proportions, albeit the size of the retinal images remains unaltered. This experiment, which, with several others of almost equal interest and importance, may be performed by means of the stereoscope, also establishes that every degree of convergence of the optic axes is associated with the particular adaptation of the eye suited for distinct vision at that distance. This adaptation is, of course, directly dependent upon the divergency, less or greater, of the impinging rays, and this again stands in a necessary relation to the distance, real or virtual, of the point from which they diverge; a branch of the subject to which we have already given sufficient prominence. All observations and experiments concur in showing that a part of the highest importance is played in vision, by the convergence of the optic axes, in particular, in so far as this is conjoined with a difference between the two retinal pictures; and, for this reason, it matters but little that we cannot, within our present limits, enter on a discussion of the evidence obtained from those persons, blind from birth, who have gained their sight by means of a surgical operation; for, in almost every case, only one eye at a time was operated upon, and the information then obtained from the patients, under circumstances of so much difficulty, is admitted on all hands to be of a very dubious and unsatisfactory character.

By mere modification of the light incident upon the eye, the same visible objects may be seen under infinite variations of figure, situation, and magnitude; while, at the same time, their real figure, real situation, and real magnitude, as apprehended by the touch, shall remain unaltered; but these phenomena, artificially induced, argue nothing against the general fact, that under normal circumstances we find, in the very place of the visible objects, those "dynamical qualities" which form the sum-total of our tactual experiences. To Berkeley is due the credit of having first pointed out the original entire disconnection and subsequent intimate blending of the two sets of experience —visive and tactual; but, if the views here proposed be correct, he erred in supposing that our realization of the geometrical proportions and relations of visible objects, is dependent on the suggestions of touch, and not upon the exercise of a primitive and inherent function of sight. To the popular view, the *objects of sight* have a positive and equal existence in absolute darkness, and are simply rendered visible by the light; whereas, they are, in truth, the light itself variously modified. But, in conclusion, while fully admitting that light and its modifications, viz., color in all its varieties, form the sole objects of sight, we venture to maintain that we only know color by our perception of it, as making up, by its superficial distribution, the visible form and shape of the objects of the outer world; and that this our perception of the shape, relative magnitude, and situation of visible objects is immediate, and strictly regulated by the laws of light in relation to the visual organ, irrespective of, and even in opposition to, tactual experience; but, at the same time, we hold that to the touch alone, we owe our ever-present and ineradicable belief, that these visible appearances have underlying them a materiality which we cannot conceive as actually modified concurrently with those changes of form and magnitude, which are perpetually occurring in relation to our faculty of sight; and therefore, in all questions which relate to real size or distance, we necessarily have recourse in thought to those qualities of matter which are apprehensible by the touch.

That an instinctive power of direct visual perception is possessed by the young of the lower species, is not denied by any; whether a like power has been bestowed upon man, we must now leave to the consideration of the philosophic reader.

See Berkeley's *Theory of Vision;* Wheatstone *On the Physiology of Vision;* review of Berkeley's *Theory of Vision*, by Samuel Bailey; review of the last-named work by J. S. Mill, in his dissertations and discussions; *Sight and Touch*, by T. K. Abbott; Helmholtz's *Popular Lectures;* art. on vision by Sully, in "Mind," Nos. IX. and X.

VISITATIONS, Heralds', periodical circuits which were in use to be performed by the provincial kings-of-arms in England, in order to take cognizance of the arms, pedigrees, and marriages of the nobility and gentry. A visitation is said to have been held as early as the reign of Henry IV.; but the earliest visitation, in pursuance of a royal commission, was made by Thomas Benolti, Clarencieux, in 1528–29, and comprehended the counties of Worcester, Berks, Oxford, Wilts, Gloucester, and Stafford. From that time, the visitations were repeated at periods varying from 25 to 30 years; never, however, extending to Wales, except on one occasion, in 1581. The latest commission was

dated May 13, 1686, and under it some pedigrees were recorded as late as 1703–4. The cessation of the visitations seems to have arisen from the frequent prohibitions granted by the court of king's bench to stay proceedings in the earl marshal's court, and the abolition of the constable as a permanent officer, in consequence of which the officers-of-arms found it difficult to enforce attendance. The records of the visitations, though not absolutely free from error, contain a mass of historical and genealogical information of great value. They form the principal source of evidence regarding the hereditary right to bear arms in England. The register-books have been scattered among various public and private libraries, including the British museum (which possesses 312 visitation books), the college-of-arms in London, and the Bodleian library. Some of them are no longer extant. A number of the visitations have lately been printed, and others are in the press. A catalogue of the visitations preserved in the British museum was printed by sir N. H. Nicolas in 1825; and an index to the pedigrees and arms in about 250 of the principal MSS. there was published by Mr. Sims in 1849; and an index to all the printed visitations by Mr. George Marshall appeared in 1866.

In Scotland there was no such regular system of visitations. A statute of James VI. (1592, c. 125) empowered Lyon king-of-arms to visit the whole arms used within the realm; and visitations were undoubtedly made in pursuance of this act; but they seem to have been very partial, and no record of them is preserved. Something like a general visitation of Scotland again took place after the restoration, under act 1672, c. 21, the statute instituting the armorial register in the Lyon office, which record was constituted the sole legal evidence of a right to bear arms, and has been continued to the present day.

VIS MAJOR (Lat., "a superior power"), corresponds to the French expression, *force majeure*, and denotes an outward influence, or force, over which man has no control—"the powers that be." The expression has come to have a diplomatic bearing, referring to acts done not in accordance with the inclination of an official, but by reason of the *vis major*.

VISOR, or **Vizor**, otherwise called **Beauvoir** or **Beaver**, the part of the helmet of the middle ages which protected the face. It was perforated to admit light, and movable, so that it could be raised or put down at pleasure. According to the rules established in the later heraldry, the helmet of a knight, when placed over his shield of arms, has the visor up, while that of an esquire has the visor down.

VISTULA, (Lat. *Vistula* or *Visula*, Ger. *Weichsel*, Russ. *Wisla*), an important river of Austria, Poland, and Prussia, rises in Austrian Silesia, near the frontier of Galicia, in a morass in the Jablunka mountains, 15 m. s.e. of Teschen (q.v.), and at the height of 2,000 ft. above sea-level. Formed by three head-waters, the White, the Little, and the Black Vistulas, the Vistula flows n.w. a few miles to the village of Weichsel, where its course is marked by a fall of 180 ft., and thence to the town of Schwarzwasser, where it leaves the mountains. At this point the Vistula turns n.e., and flows in this direction past Cracow, to its confluence with the San, 10 m. below Sandomierz, forming throughout nearly the whole of this part of its course the boundary between Galicia and Poland. From its confluence with the San the river turns to the n., enters Poland, which it traverses in a general n.w. direction, passing Lublin, Warsaw, and Lipno. Leaving Poland it enters the kingdom of Prussia, flowing w.n.w. to its junction with the Bomberger canal; thence n.n.e., past Kulm and Schwetz, to Graudenz, where it turns n. and flows in that direction to its embouchure in the Baltic sea, which it enters by several mouths. About 10 m. below Marienwerder it throws off an arm called the Nogat, which, taking a n.e. direction, and after flowing 32 m., enters the Frisches Haff by about 20 mouths. The main stream continues to flow n. for 115 m., dividing, however, into two branches, one of which flows into the Frisches Haff, the other into the gulf of Dantzic at Weichselmunde, 3 m. below Dantzic. The Vistula receives from the right the Bug, the San, the Dunajec, and the Wieprz; from the left, the Przemsza, Pilza, Brahe, Schwarzwasser, Montan, Ferse and Radune. The Vistula is 714 m. in entire length. It becomes navigable at Cracow for small vessels, and for large vessels at the confluence of the San.

VIS VIVA. See Work.

VISWÂMITRA is one of the most interesting personages in the ancient history of India. According to the Aitarêya Brâhman'a (see Veda), his father was *Gâthin;* and in a remoter degree Viswâmitra derived his pedigree from the king *Purûravas* (q.v.), who was an ancestor of Kus'ika. In the Mahâbhârata, Râmâyan'a, and the Purân'as, his father is called *Gâdhi*, and the origin of the latter likewise traced up to Purûravas; but the distance between the two latter personages is differently filled up in the genealogies given by some of these works. As, according to several accounts, Viswâmitra's sister was *Satyavatî*, who married *Richika*, and bore to him *Jamadagni*, he was the maternal grand-uncle of *Puras'urâma* (see Vishn'u, the sixth Avatâra). He had 100 sons, 50 of whom were, for an offense they committed, degraded by him to become outcasts, and the progenitors of the Andhras, Pun'd'ras, S'abaras, Pulindas, Mût'ibas, and other frontier tribes, which in the Vedas are called Dasyus, or robbers. Viswâmitra is the author of many hymns of the R'igveda (see Veda), especially of its third, Man'dala; but his fame, which pervades all the periods of Sanskrit literature, is chiefly founded on the remarkable fact, that though by birth a Kshattriya, or a man of the military caste—he is also described as a Ra'ja of Canouj—he succeeded in having himself admitted into the

Brâhmanic caste, after a long contest, which, for this end, he had to wage with the R'ishi *Vasisht'ha* (q.v.). That the result of this contest was the elevation of Viswâmitra to the rank of a Brâhman'a, is the account given in the epic poems and the Purân'as; but as the rivalry between Viswâmitra and Vasisht'ha is already alluded to in several passages of the R'igveda hymns, and as at their time the caste distinction of later periods of Hinduism was not yet established, it is probable that the later traditions relating to this contest rested on the circumstance, that *Sudâs*, a king named in the R'igveda, who, as is there stated, employed Vasisht'ha for his house-priest, allowed, for some unknown reason, also Viswâmitra to officiate for him at sacrifices, and that the latter, incurring on this ground the jealousy of Vasisht'ha, had to maintain, probably by force, the prerogative conferred on him by his royal master. In the epic poems and the Purân'as, the rivalry between these two personages is the subject of several legends, which, considering the relative age of the kings referred to in them, would encompass a period far exceeding that of the lifetime of a human being. A kind of consecutive biography of Viswâmitra is given in the first book of the Râmâyan'a, of which it forms one of the most interesting episodes. Its substance is as follows: Once, when roaming over the earth with his armies, Viswâmitra came to the hermitage of Vasisht'ha, and was there received by the saint in the most sumptuous style. Vasisht'ha could afford to entertain the king in this manner, because he possessed a fabulous cow of plenty that yielded him everything he desired. Viswâmitra, becoming aware of the source of Vasisht'ha's wealth, strongly wished to possess the cow, and asked Vasisht'ha to sell her to him. The saint, however, refusing this offer, the king seized her, intending to carry her off by force. But the cow resisted, and ultimately displayed her supernatural powers in producing from different parts of her body numerous peoples, and by their aid destroying the armies of Viswâmitra. The king then had recourse to the magical weapons he possessed, but they were defeated by those of Vasisht'ha; and to the humiliation thus inflicted on him he then gave vent in exclaiming: "Contemptible is the might of a Kshattriya; a Brâhman's might alone is might." And reflecting on what he should do in this emergency, he resolved to practice austerities in order to attain the rank of a Brâhman. In consequence he went to the s. and performed severe penance during a thousand years; when, at the end of this period, the god Brahman appeared, and announced to him that he had become a Râjarshi, or royal R'ishi. But Viswâmitra, not satisfied with this degree of holiness, continued his austerities for another such period. During that time a king, *Tris'anku* of Ayodhyâ (Oudh), of the family of *Ikshwâku*, had conceived the design of performing a sacrifice, that he might boldly ascend to heaven, and solicted for this purpose the assistance of Vasisht'ha, who was the family priest of "all the Ikshwâkus." This saint, however, having declared the scheme of the king impossible, and his sons too, to whom the king likewise addressed himself, having refused compliance with his wishes, he told him that he would resort to another priest, and was, in consequence, cursed by them to become a man of the lowest caste. In this condition he went to Viswâmitra; and the latter showed his power by performing the sacrifice, so much desired by Tris'anku, and accomplishing his object, in spite of the resistance of Vasisht'ha and his sons, and that of the gods themselves. (The *Harivans'a* relates this story with somewhat different detail, but brings it to the same issue. According to the Vishn'u-Purân'a, which alludes to the version mentioned in the last-named work, Tris'anku was the 28th in descent from Ikshwâku; but in the Râmâyan'a, there are only five kings between Ikshwâku and Tris'anku.) This event having caused a serious interruption in the austerities of Viswâmitra, he proceeded to the forest *Pushkara*, in the west, to remain undisturbed. But while he resided there, it so happened that *Ambarîsha*, another king of Ayodhyâ, intending to perform an expiatory sacrifice, and requiring a human victim for this purpose, after a long search, had bought for immolation from the Brâhman *Richîka*, the brother-in-law of Viswâmitra, his son *S'unahs'epha*, and was bringing him home to his capital. On his journey, he halted in the forest Pushkara, and when S'unahs'epha there saw his uncle Viswâmitra, he implored him to come to his rescue. Viswâmitra first directed fifty of his sons to offer themselves up as a ransom for their cousin, and, on their refusing to do so, cursed them to become outcasts; but afterward taught S'unahs'epha two hymns, which, as he said, if sung by him at the sacrifice, would save his life. (In the genealogy of the Râmâyan'a, there are twenty-one kings betwen Tris'anku and Ambarîsha; in that of the Vishn'u-Purân'a, fifteen kings; and in the former, between Ikshwâku and Ambarîsha, twenty-seven; and in the latter, between Ikshwâku and Ambarîsha, the *successor of Tris'anku*, forty-three kings.) The liberation of S'unahs'epha having been effected, and Viswâmitra having continued his penance for another thousand years, the god Brahman conferred on him the dignity of a *R'ishi*. But not yet satisfied with this distinction, he went on practicing still fiercer austerities than those he had practiced before. These the gods succeeded in depriving for a time of their spiritual efficacy, by sending him a heavenly nymph, *Menakâ*, who excited his worldly passions; still, in the end, he attained the rank of a *Maharshi*, or great R'ishi. And, after two other thousand years of still more rigorous penance, which for a time was again interrupted by the allurements of a nymph, Rambhâ, whom the gods had sent for the same purpose as previously Menakâ, the gods, headed by Brahman, came to acknowledge that he had now become a Brahmarshi, or Brâhman'ic R'ishi; and Vasisht'ha himself was compelled to express acquiescence in the result he had achieved.

For other legends relating to this contest between Viswâmitra and Vasisht'ha, see vol. i. of John Muir's *Original Sanskrit Texts* (Lond. 1858); and the article HARIS'CHANDRA. Compare also VISHN'U, the 7th Avatâra.—The name of Viswâmitra is explained in the Markan'd'eya-Purân'a as representing a compound, *vis'wa*, "all," and *amitra*, "no-friend," and meaning "one who is no-friend at all, *scil.*, the three worlds." The Mahâbhârata, however, explains it as *vis'wa*, with its final vowel lengthened, and *mitra*, friend, when it would imply that Viswâmitra was "the friend of all, *scil.*, the gods;" and *Yâska*, the oldest writer, who gives an etymology of this name, likewise renders it "friend of all."

VITA'CEÆ, also called SARMENTACEÆ and AMPELIDEÆ, a natural order of exogenous plants, of which the common vine may be regarded as the type. About 260 species are known, natives of warm and temperate climates, all shrubs, mostly climbing; with simple or compound leaves, with or without stipules, the lower leaves opposite, the upper ones alternate; the flower-stalks racemose, opposite to the leaves, sometimes (as in the vine), by abortion, changing into tendrils.—The only plant of the order of much value, in an economical point of view, is the vine (q.v.), nor are there any fine fruits except its fruit (the grape), and that of species so closely allied to it as to be not improbably mere varieties; but species of the genus *cissus* and of *ampelopsis* (which many unite with *cissus*) are sometimes planted for ornament. *Cissus antarctica* is the KANGAROO VINE of New Holland; and *ampelopsis hederacea*, often called the VIRGINIAN CREEPER, is a frequent ornament of the fronts of houses in Britain, attaching itself to the wall by tendrils terminating in a peculiar kind of sucker, and climbing to a great height.

VITAL STATISTICS are the statistics relating to increase of population, the prevalence of disease, and the duration of human life. In their simplest form, they have to do with the collection, arrangement, and study of the facts preserved in public records, bearing especially upon the birth-rate, health-reports, and death-rate of any locality.

Vital statistics are much more carefully collected and studied in Europe than in our own country. There, each government has a permanent board for the collection of statistics, and, in even the smallest towns, the births and deaths are carefully recorded by the local authorities. In countries like Germany, where every male is subject to military duty, this record is principally maintained for the information of the War office; but it affords a most fruitful and interesting field for the general statistician. In England and Scotland, the annual reports of the registrars-general (see REGISTRATION) form a valuable storehouse of information on the various births, marriages, and deaths, tables of the fatal diseases, classified in combination with ages, are given, and comments upon the salient points of the year's registration accompany the whole. The number of births, marriages, and deaths varies with the state of trade, price of food, and the seasons, and thus furnishes a test of the condition of a nation. In the United States, however, there is no national bureau that has this problem continually before it. The National Board of Health collects much that is interesting and valuable; the boards of health of many of the individual states do the same; and in the great cities, such as New York, Brooklyn, Boston, and Chicago, the vital statistics are properly recorded, but the facts gathered as yet relate to particular localities only, and do not enable one to deduce with accuracy many facts that would be of interest in their relation to the entire country. It will be of interest to take up the three topics with which vital statistics have the most to do, and set forth some of the conclusions that have been drawn from the facts laboriously gathered that relate to them. These three topics are births, longevity, and deaths.

1. BIRTHS.—Births are generally estimated in proportion to every 1000 of the population. Certain facts regarding the birth-rate may be regarded as definitely ascertained. (1) That in most countries, the birth-rate is steadily decreasing. (2) That in urban populations the birth-rate is greater than in the agricultural districts, owing to a higher marriage-rate, the earlier marriage of the women, and the greater mortality of infants which, by shortening the period of suckling, diminishes the intervals of child-bearing. (3) That child-bearing diminishes in proportion to the increase in the social position of the parents. (4) That national prosperity has a direct influence on the birth rate of some countries, but not in all—in England, for instance, but not in France. In England, years of prosperity, in which the necessaries of life are abundant, show regularly an increased birth-rate.

The influence of nationality upon the birth-rate is shown in the following table, which gives the births per 1000 inhabitants in ten countries:

EUROPEAN STATES.	Births to a Marriage.
Italy	5.15
Prussia	4.92
Sweden	4.84
Netherlands	4.83
England	4.63
Belgium	4.48
Spain	4.47
Denmark	4.24
Austria	3.73
France	3.42

The United States offer a good example of the difficulty found in estimating the relative fecundity of the native-born, and immigrant population. The former comprises not only genuine Americans, but also the offspring of foreigners born in the country, and contains an excess of children; while the foreign population contains an excess of adults of reproductive ages. It is evident, therefore, that the comparison of births per thousand of the population would not be fair. Such an erroneous method, in fact, has led to the conclusion that the foreigners are four times as prolific as the native population; whereas, the actual difference is much less marked, though there is, nevertheless, a difference in favor of the foreigners. Mr. Buck has shown that in Massachusetts, for instance, over 57 per cent. of the native women of twenty years of age and upwards, are mothers, and nearly 66 per cent. of the foreigners of the same age.

Statistics show that in all countries of the civilized world more males than females are annually born; that the proportion of males to females is greater in large than in small families, and that it is greater among the earlier born than among the later born children of a family. The following table gives the proportion of male to female births in different countries for a period of ten years:

Country.	Males born to every 1000 Females born.
Italy	1071
Austria	1068
France	1064
Switzerland	1063
German Empire	1062
Holland	1061
Belgium	1059
Scotland	1057
Ireland	1056
England and Wales	1039

It is to be noted, however, that the death-rate among males is more rapid than among females, especially during the first year of life. At the age of thirty-four, the two sexes are about equal in number; after that, the diminution in the proportion of males goes on until, at the age of seventy, the proportion stands at about 900 males to 1000 females. It is generally believed that the explanation of the excess of male births is to be found in the fact that the male parent is usually older than the female parent, the world over. Birth-rates are affected by time, place, and seasons. The birth-rate is usually highest in the first three months of the year. The greater number of births occur between midnight and 6 A.M. From statistics collected by the Philadelphia Board of Health it appears that twins are born about once in every 107 births, and triplets once in every 5600. The percentage of still-births is put on an average of 4.76, or one to every 20.9 births. The direct cause of the increase of population in any country (apart from immigration) is, of course, the excess of births over deaths, and this will plainly depend on the following causes: (1) on the prolificness of marriages; (2) on the proportion born which lives to marry; and (3) on the interval between the mean age of marriage and the mean age of death. All these conditions must be favorable to show the full power of increase in action. They have never yet, on any large scale, at least, been found operating with maximum force. In the United States we find a combination of the first two; but from the "expectation of life" (see Life, Mean Duration of) not being favorable in this country, it follows that the third cause is not in favorable operation. The so-called Malthusian theory regarding the increase of population is well known: "The population is increasing in a geometrical progression; the means of subsistence in an arithmetical progression; and, unless wars, destructive epidemics, marshes, dense towns, close workshops, and other deadly agents carry off the excess of the numbers born—unless the outlets of life and blood be left open—the whole people must be exposed to a slow process of starvation." See Malthus, Thomas Robert. One great objection to this theory has always been found in the fact that the data upon which it is based was collected at a time when great agricultural depression prevailed, and when the production of food was much less than in average years.

2. Longevity.—Vital statistics are largely employed with the question of the probable duration of life. Babbage says, regarding this topic: "Nothing is more uncertain than the duration of life when the maxim is applied to the individual; but there are few things less subject to fluctuation than the duration of life in a multitude of individuals." It is on this principle that annuities and life-insurance policies can be made the subject of exact calculation, the final results being found to vary within extremely narrow limits. The following table gives the probable term of life to be lived by the average person at the ages of 20, 30, 40, 50, 60, and 70:

Age.	"Expectation of Life," according to			
	Mutual Life of New York, Fifteen Years.	"Actuaries," or Seventeen English Companies.	Massachusetts (1855) Tables (Elliott's).	Farr's English, No. 1.
20	42.8	41.5	39.9	39.9
30	36	34.4	34	33.1
40	28.9	27.3	27.9	26.6
50	21.6	20.2	21.3	20
60	14.6	13.8	15	13.6
70	8.6	8.5	9.4	8.5

The influence of different occupations upon longevity has been made the subject of very careful study. An English authority gives the figures which show that the following trades placed according to their expectation, show an inferior expectation: clerks, potters, printers, bricklayers, blacksmiths, mill operatives, plumbers, stone-masons, miners, wool-combers, coopers, hatters, spinners, tailors, dyers, sawyers, millwrights, town and city laborers, and shoemakers. The following trades show a superior expectation: wheelwrights, butchers, bakers, weavers, domestic servants, carpenters, and rural laborers. Of the professions, statistics show that clergymen live to the greatest ages, lawyers die considerably younger, while physicians are at a disadvantage compared with lawyers. Taking 1000 to represent the majority of all males, the mortality among clergymen will be represented by 556; of lawyers, 842, of teachers, 719, and of physicians, 1122. Matrimony exercises a favorable effect upon the longevity of the individual. The following table compiled by Dr. Bertillon shows that the death-rates of married adults are considerably lower than those of the unmarried, while the death-rates for widowers and widows are the highest of all:

DEATH-RATE PER 1000 LIVING OF MARRIED AND UNMARRIED.

Ages.	Males.			Females.		
	Single.	Married.	Widowers.	Single.	Married.	Widows.
20–25	12.88	8.92	49.60	8.32	9.92	12.31
25–30	10.17	6.24	21.84	9.02	8.98	23.62
30–35	11.51	6.82	19.17	9.87	9.36	16.90
35–40	13.15	7.52	17.50	10.87	9.29	15.03
40–45	16.62	9.55	18.89	13.28	10.14	12.73
45–50	19.60	11.47	22.20	15.71	13.69	13.30
50–55	25.80	15.61	26.80	20.97	14.11	15.20
55–60	32.10	21.50	34.17	26.90	19.29	24.47
60–65	45.92	32.60	47.50	40.52	30.75	37.07
65–70	58.50	44.80	62.97	58.30	45.30	53.50

Longevity is the greatest in those whose lives are regulated by a strictly normal physiological standard. This consists in the perfect balance of all the organs and their harmonious working. Dr. Nathan Allen aptly compares the body to a complicated machine, so thoroughly and perfectly made that the friction comes equally on every part according to the design of its construction. A change at any one point destroys the balance and thus becomes the entering wedge of disease. Hence the true standard of health is when every organ is perfect in structure and function. Hence we find that the very aged are remarkable for the evenness of the mental, moral, and social elements of their character. The law of longevity is practically, too, the law of increase. A predominance of the nerve tissue tends to lessen the birth-rate, and hence to extinguish gradually the race. This is illustrated in the case of the nobility of Europe and of the native Americans of New England.

Students of vital statistics are skeptical regarding the cases of extreme longevity that form a part of the literature of the subject. Such statements as those recorded in history, to the effect that Attila the Hun lived to the age of 124, that Piastus, king of Poland (A.D. 824), lived to the age of 120, and other similar assertions, are generally rejected. There are many well-authenticated instances of centenarians who have lived within the last four years. The best-known example is M. Chevreul, the distinguished French chemist, who died April 9th, 1889, at the age of 102. In 1886, Mr. Frederick Nash, of Westport, Conn., published a list of twenty-three centenarians then living in Connecticut, the record of whose ages seemed to be beyond question.

The average longevity of the human race is steadily increasing in England, France, and the United States. This is due to a much greater attention to the laws of health, to better food, to the more perfect, modern system of sanitation, and to the great advance in the science of preventive medicine. See Longevity.

3. Deaths.—The following table, compiled by the officials of the Marine Hospital in Washington in May, 1891, shows the death-rate in the principal cities of the United States for the preceding year:

	DEATH-RATE PER 1000.		DEATH-RATE PER 1000.
Auburn, N. Y.	22.1	Newport, R. I.	17.1
Baltimore, Md.	23.3	Newton, Mass.	14.8
Binghamton, N. Y.	16.0	New York, N. Y.	26.6
Boston, Mass.	22.9	Pensacola, Fla.	10.8
Brooklyn, N. Y.	24.3	Philadelphia, Penn.	20.7
Charleston, S. C.	32.4	Pittsburg, Penn.	21 3
Chicago, Ill.	19.6	Portland, Me.	19.9
Cincinnati, Ohio	22.3	Providence, R. I.	19.2
Cleveland, Ohio.	19.2	Richmond, Va.	28.3
Denver, Col.	26.9	Rochester, N Y.	15.8
Galveston, Texas	20.4	St. Louis, Mo.	18.3
Indianapolis, Ind.	16.2	San Diego, Cal.	10.6
Louisville, Ky.	21.9	San Francisco, Cal.	22.8
Nashville, Tenn.	18.8	Washington, D. C.	23.7
Newark, N. J.	25.1	Yonkers, N. Y.	16.8
New Orleans, La.	29.2		

The following table gives the average death-rate in the principal foreign cities:

	DEATH-RATE PER 1000.		DEATH-RATE PER 1000.
Alexandria, Egypt	36.52	Liege, Belgium	23.22
Amsterdam, Holland	24.48	Liverpool, England	26.94
Antwerp, Belgium	26.03	London, England	23.62
Aschersleben, Germany	22.31	Madras, India	34.36
Basel, Switzerland	26.07	Manchester, England	26.80
Belfast, Ireland	30.66	Manchester Parish, Jamaica	13.68
Belgrade, Servia	38.22	Marseilles, France	32.32
Berlin, Germany	27.80	Melbourne and suburbs, Victoria	19.23
Bern, Switzerland	31.42	Milan, Italy	29.51
Bernburg, Germany	23.16	Montreal, Canada	27.44
Birmingham, England	22.12	Naples, Italy	29.28
Bombay, India	34.87	Naumburg, Germany	22.23
Bremen, Germany	22.44	Nottingham, England	22.54
Bruges, Belgium	25.53	Odessa, Russia	37.91
Brussels, Belgium	24.38	Paris, France	25.69
Buda-Pesth, Hungary	37.51	Portland Parish, Jamaica	20.27
Calcutta, India	30.37	Portsmouth, England	16.67
Christiana, Norway	17.40	Prague, Bohemia	29.26
Clarendon Parish, Jamaica	20.78	Quedlinburg, Germany	25.06
Coburg, Germany	18.89	Rome, Italy	22.80
Cologne, Germany	26.36	Rotterdam, Holland	27.02
Copenhagen, Denmark	25.79	St. Andrew's Parish, Jamaica	27.13
Dresden, Germany	24.02	St. Ann's Parish, Jamaica	19.88
Dublin, Ireland	35.70	St. Catherine's Parish, Jamaica	23.92
Edinburgh, Scotland	19.59	St. Elizabeth's Parish, Jamaica	21.28
Eisenach, Germany	22.70	St. Mary's Parish, Jamaica	21.76
Frankfort-on-the-Main, Germany	21.55	St. Petersburg, Russia	38.81
Glasgow, Scotland	23.07	St. Thomas' Parish, Jamaica	22.87
Gottenburg, Germany	26.54	Sheffield, England	21.21
Hamburg (including Territory), Germany	26.53	Stockholm, Sweden	22.52
Hanover, Germany	20.07	Sydney, New South Wales	21.06
Havana, Cuba	46.32	The Hague, Holland	24.82
Havre, France	34.19	Trieste, Austria	35.63
Kingston Parish, Jamaica	37.05	Vienna, Austria	28.57
Kingston-upon-Hull, England	22.10	Warsaw, Russian Poland	25.73
Leeds, England	22.49	Wiemar, Germany	16.57
Leicester, England	21.54	Wissenfels, Germany	26.86
Leipsic, Germany	23.46		

In the census year of 1880, the proportion of deaths to the population in the United States (rate per 1000) was 15.09, composed as follows: Alabama, 14.20; Arizona, 7.20; Arkansas, 18.46; California, 13.33; Colorado, 13.11; Connecticut, 14.74; Dakota, 9.65; Delaware, 15.09; District of Columbia, 23.60; Florida, 11.72; Georgia, 13.97; Idaho, 9.90; Illinois, 14.63; Indiana, 15.78; Iowa, 11.93; Kansas, 15.22; Kentucky, 14.39; Louisiana, 15.44; Maine, 14.67; Maryland, 18.10; Massachusetts, 18.59; Michigan, 12.06; Minnesota, 11.57; Mississippi, 12.89; Missouri, 16.89; Montana, 8.58; Nebraska, 13.11; Nevada, 11.69; New Hampshire, 16.09; New Jersey, 16.33; New Mexico, 20.37; New York, 17.38; North Carolina, 15.39; Ohio, 13.32; Oregon, 10.67; Pennsylvania, 14.92; Rhode Island, 17.00; South Carolina, 15.80; Tennessee, 16.80; Texas, 15.54; Utah, 16.77; Vermont, 15.12; Virginia, 16.32; Washington, 10.05; West Virginia, 11.99; Wisconsin, 12.17; Wyoming, 9.09. Of this proportion 1.82 died from consumption; rate per 1000 of total deaths from that disease, 120.95; total number of deaths from consumption, 1880, 91,551.

For fuller information on the subject of Vital Statistics, the reader is referred to the following works: Farr, *Vital Statistics*, ed. by N. A. Humphreys; Buck, *Hygiene and Public Health* (1878); Humphreys, *The Decline in the Death Rate* (1883); Parks, *Some Aspects of Mortality Statistics* (1888); Ransome, *The Vital Statistics of Towns* (1888); Newsholme, *Vital Statistics* (1891). See Sanitary Science.

VITASCOPE. See ZOETROPE.

VITE, OR VITA, TIMOTEO, called also Timoteo della Vite di Urbino, an Italian painter and a relative of Raphael, was born at Urbino in 1470. His art studies were prosecuted at Bologna under Francesco Francia, but in 1496 he went back to Urbino, then removed to Rome to study in the academy his distinguished relative had opened in the Vatican. Later, he returned to Urbino, where he died in 1524. He aided Raphael in his frescos of the Sibyls, and acquired some of the former's grace of composition and manner of coloring. He painted Raphael's portrait, and a number of works of great merit, among them a "Conception" for the Osservanti at Urbino, and a "Noli Me Tangere," for the church of St. Angelo at Cagli. It is believed that Pietro della Vite, an imitator of Timoteo and known to be also related to Raphael, was a brother.

VITEBSK, a government in the n. of West Russia, bounded on the n.w. by Courland and Livonia, and on the n.e. by the government of Pskov. Area, 17,440 sq. m.; pop. '94, 1,426,901. The surface is, as a rule, hilly, though wooded plains, marshes, and lakes abound. The Dwina flows for 466 miles in this government; and by means of this river and its affluents, large quantities of timber are floated down to the port of Riga. The soil is fairly fertile, and flax is successfully grown in large quantities; and this material, together with timber, constitutes the chief articles of export. Shipbuilding is carried on, on the Dwina; the lake-fisheries are profitable; and tanning is the most important branch of industry.

VITEBSK, a city of West Russia, capital of the government of the same name, on both banks of the Western Dwina, 345 m. s. of St. Petersburg. It covers a very large area, and contains many monasteries, churches, and synagogues. Manufactures are not extensive; and the trade—the chief articles of which are corn, flax, hemp, tobacco-leaves, sugar, and timber—is carried on by Jews, who form the larger section of the population. Vitebsk is connected by railway with Dünaburg and Smolensk. Pop. '97, 66,143.

VITELLI, VITEL, OR WITTEL, GASPARD VAN, called also Gaspard degli Occhiali, 1650–1736, painter, was born in Utrecht. He studied under Mathieu Withors, but when quite young went to Italy, where he passed the rest of his life, part of the time at Naples, whither he was called by the viceroy, who became a devoted patron. Vitelli was a most faithful delineator, and an industrious worker, in spite of the loss of one eye. His perspective was fine and his coloring brilliant. Among his works were miniatures in the style of Canaletto, and many architectural and landscape paintings; among them, "View of the Castle of St. Angelo," now in Florence, and "View of St. Peter's at Rome," in a gallery in Vienna.

VITELLIN. This name was, until recently, given by chemists to a supposed protein body occurring in the yelk of egg. It has been discovered by Lehman that this substance is merely an admixture of casein and albumen.

VITELLIUS, AULUS, Roman emperor, son of Lucius Vitellius the prince of the sycophants who surrounded Caligula, but who, according to Tacitus, "in his provincial administration exhibited the virtues of a former age," was born Sept. 24, 15 A.D., and through his father's influence at court became consul, 48 A.D., and afterward proconsul of Africa, where his administration gave great satisfaction. He had been a companion of Tiberius at Capreæ, and was equally a favorite with Caligula, Claudius, Nero, and Galba, the last of whom appointed him commander of the legions in Lower Germany, thinking his intense devotion to gastronomic pleasures would effectually prevent his becoming a rival. However, Vitellius had not been a month in his new post, till he had completely gained the affections of his soldiers by extreme familiarity and liberality (strongly contrasting with Galba's parsimony); and on Jan. 3, 69, they took him from his tent, and proclaimed him emperor. This decision was adopted by the rest of the troops in Gaul; and two armies, under Valens and Cæcina, immediately set out to secure Rome, Vitellius following leisurely. A notice of his contest with Otho in Northern Italy will be found under OTHO. The adherents of his predecessor were leniently treated, with the exception of the centurions of Otho's army, who were put to death, an act which greatly offended his own supporters. Vitellius's journey to Rome was a curious specimen of a triumphant advance, the nominal conqueror being invariably muddled with liquor, and the soldiers of his army straggling about, committing excesses of all sorts with perfect impunity. At last he reached Rome, and without loss of time proceeded, by right of his office as Pontifex Maximus, to deify Nero. The administration was mostly in the hands of the freedman Asiaticus, though P. Sabinus (brother of Vespasian), and the two generals who had gained for him the imperial dignity, were high in authority; and the government was marked by great moderation, for Vitellius was too far sunk in the vilest debauchery to be capable of tyranny. But he was not long allowed to disgust the respectable part of the citizens of Rome; for the legions of Pannonia and Illyricum, having proclaimed Vespasian emperor, advanced into Italy under Antonius Primus. They were opposed by the Vitellian troops, commanded by Cæcina, but through the treachery of the latter general, gained a decisive victory near Bedriacum, and another, on the following evening, over another Vitellian army which had marched to the support of the first. Vitellius, at this critical period of his fortunes.

nothing abated his swinish indulgences; but his brother, Lucius, in the south, displayed more energy, and defeated Vespasian's partisans in several battles. Meantime, the soldiers, enraged at the treachery of P. Sabinus, and his allies among the senators and knights, stormed the Capitol, and slew Sabinus. From this time, Rome was a scene of unintermitting violence and bloodshed till the troops of Primus entered the city. Vitellius was found wandering about his palace in a state of stupid terror, and after being ignominiously exposed in the streets, was killed by repeated blows, his head carried about Rome, and his body thrown into the Tiber, in Dec. 69 A.D.—For a complete sketch of his private life, see Tacitus's *Historia*, ii., iii., and Dion Cassius, 65; see also Suetonius, *Vit. Duodec. Cæsarum.*

VITELLIUS, Erasmus, was born at Cracow, Poland, about 1470, and died in 1522. He was of humble or obscure origin, and was educated at the University of Cracow by a family named de Vitellio, whose name he assumed. He became doctor in 1491, and in 1504 was made bishop of Plock. He was employed in various diplomatic services, and in 1518 was sent to the Diet of Augsburg by Sigismund the Great (q.v.) to ask for help against the Turks.

VITELLIUS, Lucius, father of the Emperor Aulus Vitellius, was consul in 34 A.D., and later was appointed governor of Syria. By his arts he induced Artabanus, King of the Parthians, to conclude a peace, and to make obeisance to the signa of the Roman legions, but incurred the jealousy of Caligula, who sent for Vitellius in order to put him to death. The latter, by the grossest flattery and humiliation, saved himself, and by similar means obtained favor with Claudius and Messalina, and was promoted in office, being twice consul under Claudius. After the execution of Messalina, Vitellius upheld Claudius in his desires to marry his own niece, Aggripina. In spite of his bad repute at Rome, Vitellius, who died about the year 52, was honored by the senate with a public funeral, and a statue, erected in front of the Rostra. His son Lucius was consul in 48 A.D.

VITELLUS O'VI, or the *yelk* of the egg of the domestic fowl, is employed in pharmacy for the purpose of administering substances insoluble in water (the oils and resins, for example) in the form of emulsions. The *white* is employed as an antidote, in cases of poisoning by corrosive sublimate or with salts of copper. As a dietetic article in the sick-room, eggs, either lightly boiled or poached, or as ingredients of puddings, are invaluable; the stomach, after an acute disease, being often able to digest an egg, when any more solid article of animal food would set up gastric irritation.

The article Egg, Chemistry of, requires a few supplementary remarks. The albumen, occurring in the *white*, is for the most part in combination with soda; in addition to this principal ingredient, the white contains fats (chiefly margarin), grape-sugar (averaging 5 per cent of the dried residue), and soluble salts, in which the chlorides preponderate, with a little silica (for the formation of feathers) and fluorine. The yelk consists of casein (forming 14 per cent), albumen (about 3 per cent), fats, some of which contain phosphorus (about 30 per cent), a little grape-sugar, and mineral constituents (about 1.5 per cent), in which there is a great preponderance of potassium compounds and phosphates. Of the pigments of the yelk we only know that there is both a yellow and red pigment, and that one at least of them contains iron. It is difficult to conceive a more concentrated form of nourishment than a food thus composed of casein, albumen, fat, sugar, potassium salts, phosphates, and iron; and its resemblance in composition to milk is very remarkable.

The shell of the egg consists almost solely of carbonate of lime (about 97 per cent), with a little phosphate of lime, and traces of magnesia and organic matter. The variety of color in the eggs of different birds is supposed to be due to certain modifications of bile-pigment with which they come in contact in the cloaca.

VITERBO, a city in central Italy, in the province of Rome, stands amid gardens and vineyards, at the foot of Monte Cimino, 54 m. n.n.w. of Rome by railway. Its well-built streets are paved with marble, and there are numerous elegant fountains. Its Gothic cathedral contains the tombs of several popes, and is memorable as the scene where Guy de Montfort assassinated prince Henry, nephew of Henry III. of England. Pop. 18,000.

VITET, Ludovic or Louis, a French author and statesman, was born at Paris in Oct., 1802, and studied at the normal school in that city. His first book, *Les Barricades* (1826; 4th ed., 1850), was published anonymously, but had an important effect upon modern dramatic literature; this, together with *Les États de Blois* (1827), and *La Mort de Henri III.* (1829), were combined in one work entitled *La Ligue* (1844). In 1830 he obtained from Guizot the position of inspector of historical monuments, an office created especially for him; in 1834, became secretary-general of commerce, and in 1836, entered the council of state. From 1834 to 1848 he represented Seine-Inférieure in the Chamber of Deputies, supporting conservative policies; was returned in 1871, and was several times vice-president. He was admitted to the French Academy in 1845. He died at Paris in June, 1873. His works in art, archæology, and philosophy are numerous.

VIT'EX, a genus of trees or shrubs of the natural order *verbenaceæ*, the fruit a drupe, with a 4-celled stone. *V. agnus castus*, the Chaste Tree, a native of the countries around the Mediterranean, is downy, with digitate leaves, white on the back, and has an

acrid fruit, the seeds of which are used in Smyrna as an external application in cases of colic. It derives its name from the practice of Grecian matrons to strew their couches with its leaves, especially during the sacred rites of Ceres, in order to banish impure thoughts; for which purpose a syrup, made of its fruit, was also, and perhaps still is, used in convents in the s. of Europe, although, in reality, it possesses stimulating properties.— *V. negundo*, an Indian species, has aromatic leaves, which are bruised and applied to the temples for relief of headache.— *V. trifolia* is another Indian species, whose leaves are a powerful discutient.

VITICULTURE. See VINE.

VITILI'GO was the name given by Celsus to some kind of cutaneous eruption which cannot be clearly identified. The term has, in recent times, been used by different writers in different senses, but is now most commonly employed to designate cutaneous patches characterized by loss of pigment.

VITIOUS INTROMISSION, in the law of Scotland, means the unwarrantable interference and management of the movable estate of a deceased person.

VITO'RIA, a pleasant, gay, and thriving inland t. in the. n. of Spain, capital of the province of Alava, stands on a gentle elevation, 70 m. w. of Pamplona. The old town, the Villa Suso, consists of dark and tortuous streets; the new town is regularly laid out. There are several charming *alamedas*, or public walks, especially La Florida and El Prado. The plaza Nueva, a square of 220 ft., was built in 1791, and under its arcades is the favorite promenade in winter. Brass and iron wares, leather goods, candles, and linen goods are manufactured, and a brisk general trade is carried on with towns further inland. The plain surrounding the town is extensive and fruitful. The climate is temperate and healthy. Pop. '87, 27,660.

Vitoria will be ever memorable for the decisive and important victory which Wellington gained here over the French under Joseph Bonaparte and Jourdan, June 21, 1813. The numbers in this encounter were nearly equal. The French lost 6000 killed and wounded, 150 cannon, together with baggage, eagles, and an amount of booty in pictures, etc., which amounted to $5,000,000. The direct result of the battle of Vitoria was, that the French had to retire from Spain. About this engagement, Southey says the French "were beaten before the town, in the town, through the town, out of the town, behind the town, and all about the town." The loss of the British, Portuguese, and Spaniards was 4900 men.

VITRÉ, an ancient t. of Brittany, France, in the department of Ille-et-Vilaine, on the left bank of the Vilaine, 24 m. e. of Rennes by railway. It is a curious specimen of the old towns of the middle ages, and is still partly surrounded with Gothic ramparts flanked with towers. Four m. s. is the château des Rochers, the celebrated residence of Mme. de Sévigné. Manufactures of cloth and hats are carried on. Pop. (commune) 10,607.

VITRIFIED FORTS, the name given to certain remarkable stone inclosures bearing traces of the action of fire, about fifty of which exist in various parts of Scotland. They are generally situated on a small hill, overlooking a considerable valley, and consist of a wall, which may have originally been about 12 ft. in height, inclosing a level area on the summit of the hill. The most remarkable feature of these structures is, that the wall is always more or less consolidated by the action of fire—in some cases only to the extent of giving a glassy coating to its inner side, while in other instances the vitrification has been more complete, the ruins assuming the character of vast masses of coarse glass. Structures of this kind are to be found at Noath and Dunnideer, in Aberdeenshire; Craig Phadrick, Tordun, and Glenever, in Inverness-shire; Knockfarril, in Rossshire; Creich, in Sutherlandshire; Dunskeig, in Argyleshire; Finhaven, in Forfarshire; and elsewhere, but principally in the northern counties. They were first noticed by Mr. John Williams, in his *Account of some Remarkable Ancient Ruins lately discovered in the Highlands and Northern Parts of Scotland*, published in 1777. Mr. Williams's observations led him to conclude that they were artificial structures intentionally vitrified by a partial melting of their materials. Mr. Williams's views were combated by other writers, who contended that the supposed forts were of volcanic origin, a supposition quite irreconcilable with their obviously artificial character. In 1828 the subject engaged the attention of the society of antiquaries of Scotland, a series of careful observations being made by Dr. Samuel Hibbert, one of the secretaries of that body; and the conclusion arrived at was, that while the structures were artificial, the vitrification was an accidental effect, which might have arisen from such causes as the frequent kindling of beacon fires as signals of war and invasion, or of bonfires forming a part of festive or religious rejoicings. The alkali produced from the accumulation of the ashes of continually blazing wood-fires would be a powerful aid to the fusion of stone. The view originally taken by Mr. Williams has since been supported by Dr. John M'Culloch, who argues that the character of the works shows them to have been designed for defensive military posts, and observes, that in some cases where the most accessible materials for a stone-fort are incapable of vitrification, stones more capable of being vitrified have been brought from a distance. Dr. Petrie has noted one vitrified fort in the county of Cavan, and four in the county of Londonderry, and he conjectures that they belonged to the Irish Picts. A single instance, that of the "camp of Péran" in Brittany, occurs in France. In this case, only the central portion, or core, of the wall is vitrified, and in it

a Roman roofing tile was found by M. Lukis firmly attached to the melted stone. A number of the hill-forts of Bohemia have also been found to be constructed with a core of vitrified stones occupying the center of the walls. Dr. Fodisch attributes them to the bronze age and to a Celtic race. More detailed descriptions of these Irish, Breton, and Bohemian examples, however, are necessary to enable us to pronounce definitely as to their identity with those of Scotland. But there seems to be little doubt that the vitrification in them all was the work of design, though produced, it may be, by different methods, and with structural intentions not quite the same.—See *Archæologia Scotica*, vol. iv.; M'Culloch's *Highlands and Western Islands of Scotland;* Burton's *History of Scotland*, chap. 3; *Proceedings Soc. Antiq. Scot.*, vol. viii. p. 145.

VITRINGA, Campegius, an eminent Dutch divine and commentator, was b. at Leuwarden in Friesland, May 16, 1659. He studied at Franecker and Leyden, at which latter place he was created D.D. in his 20th year. In 1681 he was appointed professor of oriental languages; and two years later, received the chair of theology in the university of Franecker, where he died, Mar. 21, 1722. Vitringa is regarded as one of the most learned and laborious divines of his age, and has left many excellent and erudite works, chiefly commentaries on portions of the Scriptures, nearly all of which are in Latin. Among others may be mentioned, *Commentarius in Jesaiam; Anacrisis Apocalypseos Johannis Apostoli; Commentarius in Jeremiam; Commentarius in Zecharaiam; Vetus Synagoga; Dissertationes Sacræ; Typus Theologicæ Propheticæ*, etc.

VITRIOL (derived from the Latin *vitrum*, glass) is a term which the early chemists applied to glass-like salts, distinguishing them by their colors into blue vitriol, green vitriol, and white vitriol. *Blue vitriol* is still the popular name for sulphate of copper, which may be obtained on a large scale in various ways; by roasting copper sulphide (CuS), and extracting with water; by crystallizing the water of copper mines; by moistening copper with sulphuric acid and exposing it to air or to heat; by the action of hot, strong sulphuric acid on copper. Practically, it is seldom made directly from copper but from the sulphide, copper "matt," and the solution obtained in parting silver. It occurs in large, blue, triclinic prisms, with the formula, $CuSO_4,5H_2O$. These require, at ordinary temperatures, nearly three times their weight of water for solution (2.71), but dissolve in .55 parts of boiling water; the solution is blue, astringent in taste, acid in reaction. The crystals lose a little water spontaneously; when heated to 100°C. (212°F.) they lose $4H_2O$, and at about 200°C. (392°F.) the remainder; in this condition the salt is used as a drying agent because of its readiness to recombine with water. Copper sulphate is largely employed in batteries, in electro-plating, in the manufacture of pigments, especially blue and green, and in the preservation of wood. It has some application in medicine. It is stimulating, irritant, astringent, and even escharotic. Its internal use is almost wholly to stimulate the gastro-intestinal mucous membrane. In doses of 5 grains it acts as an emetic, but sulphate of zinc is better. Externally it is applied to warts, ulcers, granulations, and bleeding surfaces.

Green vitriol is the popular name for sulphate of iron. Its characters, the method of obtaining it, and its therapeutic uses, are sufficiently noticed in the article Iron.

White vitriol will be described in the article Zinc.

Oil of vitriol is the old name given to commercial sulphuric acid, in consequence of its oily appearance, and of its being formerly obtained from green vitriol.

Elixir of vitriol is the old name for the aromatic sulphuric acid of the pharmacopœia. It is a mixture of three ounces of sulphuric acid and two pints of rectified spirit, in which powdered cinnamon and ginger have been digested. Its uses in doses of from ten to thirty minims, in a wine-glassful of water, are much the same as those of dilute sulphuric acid, but it is more agreeable to the taste, and sits more lightly on the stomach.

Vitriolated soda is an old name for the sulphate of sodium ($Na_2SO_4,10H_2O$), as it may be made by the action of oil of vitriol on various soda salts.

Vitriolated tartar is sulphate of potassium (K_2SO_4).

VI'TRO DI TRI'NA, the name given to a beautiful kind of glass which was made by the Venetians in the 15th century. Its distinguishing character is a series of wave-like marks in opaque colors, but usually white, arranged pretty regularly in the substance of transparent glass.

VITRU'VIAN SCROLL, a continuous scroll-work forming a kind of cresting used in classical architecture.

VITRU'VIUS, the name of two Roman architects, the most celebrated of whom is Marcus Vitruvius Pollio, about whom we have no direct information further than the mention of his name by Pliny and Frontinus, though, from the references to himself in his own work, we can gather that in all probability he was born about 76 or 80 B.C. He received a liberal education, pursued specially those studies which were calculated to fit him for the profession of an engineer and architect, and was engaged in the African war (46 B.C.) as superintendent of military engines. He does not seem to have become very popular as an architect, and never succeeded in acquiring wealth, though the constant patronage which the emperor (Augustus) was induced by his sister (probably *Octavia Minor*) to extend to him, insured him comfortable subsistence during his

life. The only public work he executed was a basilica at Fanum. Vitruvius in his book, *De Architectura*, enters at some length into the reasons which induced him to write it, the chief of them being, the care bestowed by his patron (after settled peace had been secured to the empire) on buildings public and private, his intention to erect numerous edifices, and the danger that, owing to the depraved architectural taste of the time, the beauty and correctness of the pure Grecian models would be neglected. The *De Architectura* is arranged in ten books; the *first* of which contains a dedication to the emperor, a general view of architectural science, hints as to the proper subjects of study for young aspirants, and directions for building cities; the *second* treats of the early history of architecture, and of the materials employed at various times, and contains a sketch of the physical theories of various philosophers; the *third* and *fourth* treat of the erection of temples, and in connection with this, of the four orders of architecture, Ionic, Corinthian, Doric, and Tuscan; the *fifth* treats of public buildings; the *sixth*, of private houses in town or country; the *seventh*, of the finishing and decoration of private buildings; the *eighth* of water, the mode of discovering it, whence it may be obtained, and the modes of conveying it in large quantities to a distance; the *ninth*, of the principles of gnomonics, the rules for dialling, and other subjects physical and astronomical; and the *tenth*, of machines used in building and in military warfare, of the mechanical powers, of mills, engines for raising water, odometers, etc. To each book there is a preface, more or less connected with the main subject of the book, and it is in these prefatory remarks that we discover what we know of Vitruvius's personal history. There have been many editions of Vitruvius; the first was published along with Frontinus's *De Aquaeductibus* at Rome about 1486, and afterward at Florence (1496) and Venice (1497). rude woodcuts were introduced into various subsequent editions; that of Bode (Berl., 1800) has a volume of plates; but the best edition is that of Rose and Müller-Strübing (Leipsic, 1867). There is an English translation by Gwilt (last ed. London, 1874).

VITTO'RIA, a modern t. of Sicily, in the province of Siracusa, 18 m. n.w. of Modica by railway on the Camarana. It possesses little interest, and is made only a resting-place for travelers. The soil of its vicinity, however, is fertile in fruits and wines; bee-culture is carried on; and there is an active trade in silk, and cattle. Pop. '81, 22,995.

VITTORIO, t. of n. Italy, in the province of Treviso, on the Meschio, a tributary of the Livenza. It was formed in 1879 by the union of the two towns Cenada and Serravalle, is an episcopal see, and has a cathedral and numerous handsome palaces and villas; pop. '81, 16,325.

VITUS, ST., DANCE. See CHOREA.

VIVA VOCE (Lat., "with the living voice"), freely rendered, signifies "aloud." A *viva voce* examination is an oral examination. A *viva voce* vote is one where the ayes and noes are given orally.

VIVANDIÈRE, in continental armies, and especially that of France, a female attendant in a regiment, who sells spirits and other comforts, ministers to the sick, marches with the corps, and contrives to be a universal favorite. Although a familiar friend to all, these women contrive to maintain themselves respectable, and generally respected; and a corps is usually extremely jealous of any discourtesy shown to its vivandière. The woman wears the uniform of the regiment, short petticoats replacing the man's tunic.

VIVE HENRI-QUATRE, historical French song, of doubtful authorship. The music has been assigned to Du Caurroy (1549–1609). It is supposed that it was a *Chanson à boire* of the time of Henri IV., and that Collé (1709–1783), made additions to it. During the Bourbon Restoration, it was chosen for the national anthem, and it was played at the Académie Royale de Musique as an overture to the opera on the day that the allied armies entered Paris, April 1, 1814. Paër wrote variations upon it, and Grétry introduced it into his opera, *La Magnifique* (1773), and Rossini into *Il Viaggio à Reims* (1825). See Grove's *Dictionary of Music and Musicians*.

VIVERRIDÆ are a family of semi-plantigrade carnivorous animals, embracing the *viverra* of Linnæus, who placed it between *felis* and *mustela*. The civets (*viverra*) of Cuvier are placed in the last edition of his *Règne Animal* between the dogs and hyenas, which are followed by the cats (*felis*). The genera and species are numerous. They are all of moderate size, with sharp muzzles and long tails, and are more or less striped, banded, or spotted. The dental formula of the genus *viverra* is

$$i\,\frac{3-3}{3-3};\quad c\,\frac{1-1}{1-1};\quad pm\,\frac{4-4}{4-4};\quad m\,\frac{2-2}{2-2}=40.$$

The upper fourth premolar and the lower first molar have cutting edges, while both the upper molars and the last lower molars have crowns faced with tubercles. The canines are long and sharp, and the tongue is very rough, with numerous hard, elongated papillæ; the claws are partially retractile, and on exposure to the light the pupils contract to a line. In most of their characters, therefore, the viverridæ are much more carnivorous than the mustelidæ, and have close affinities with the hyenas. Several species of the family have anal glands which secrete a peculiar odorous, fatty substance called *civet*. They all belong to the old world. An American genus, *bassaris*, was once referred to the family, but it is now known that the structure of its skull relates it to the rac-

coons. The true civet-cat is a native of n. Africa and eastern Asia. See CIVET.

Among other forms referred to the viverridæ, are the *mangusta* (ichneumon, q.v.), the genet (q.v.), the *suricate* (q.v.), the *paradoxurus*, the *mangue* or crossarchus of western Africa, and the *cryptoprocta* of Madagascar. The paradoxurus has much the character of the civets and genets. It has a tail capable of being rolled to its base, but it is not prehensile; toes five, nearly palmated; sole of foot tuberculous, applied throughout its surface to the ground. The *paradoxurus typus*, or paradoxure, was confounded by Buffon with the common genet (correction made by M. F. Cuvier). In form and habits it does not differ much from that animal, but the odoriferous pouch is absent. The tail is very peculiar. It is as long as the body, and depressed above and below. The extreme end when extended is turned over, bottom uppermost, and the animal can roll it up spirally from the extremity to the base. In the *crossarchus* the head is more rounded than in the ichneumons, and the muzzle is larger and movable. The pupil is round, and the tongue smooth on its edges, but rough and horny in the center. Pouch, secreting an unctuous, fetid, fatty matter. *Crossarchus obscurus* is nearly two feet long including the tail, which is about eight inches. The fur is composed of two kinds of hair, the external harsh, of a uniform brown, a little brighter on the head; cheeks pale. The genus *cryptoprocta* approaches more nearly than most of the other forms to the *felidæ*, having claws on both feet retractile, and furnished with the retractile ligaments. It has a slender body; strong limbs of moderate length; head narrow and slightly elongated; small glandular muzzle; nostrils with deep lateral sinus; numerous stiff whiskers; ears rather large and rounded, with a fold on the posterior margin and hairy within and without, except in the auditory passage; fore rather shorter than hind limbs; tail as long as body, reaching, when turned over, to the ears; soles on fore feet naked to carpus, on the posterior, to the heel; toes united nearly to the tips. *C. ferox* is a native of Madagascar.

VIVES, JUAN LUIS, LL.D., 1492–1540; b. Valencia, Spain; studied at Paris and Louvain; professor of the Latin language at Louvain; published a book at Paris in 1519 against the schoolmen; formed an intimate friendship at Louvain with Erasmus and Budæus; invited to England by Henry VIII., who made him tutor of the princess Mary, 1523; wrote for her two essays entitled *De Ratione Studii Puerilis Epistolæ Duæ;* imprisoned by order of Henry VIII. for opposing the divorce of queen Catharine of Aragon, 1528; when released went to Bruges. He wrote on philology, philosophy, and divinity. His principal works are *De Causis Corruptarum Artium; De Initiis Sectis et Laudibus Philosophorum; De Veritate Fidei Christianæ; De Anima et Vita;* commentaries on Augustine's *City of God*, the *Dream of Scipio*, the *Bucolics of Virgil.*

VIVIPAROUS FISH. It has been mentioned in the articles FISHES and REPRODUCTION that a few species of fishes are viviparous, or rather ovoviviparous, the eggs being hatched within the ovary. An example of this occurs in the viviparous blenny of the British coasts. See BLENNY. But it is the common characteristic of a whole family of the order *pharyngognathi*, therefore designated by the popular name of viviparous fish, and by the scientific name of *embiotocidæ*—a name formed from the Greek, and signifying *viviparous*. The general aspect of fishes of this family is somewhat perch-like; the scales are cycloid, the gill-covers are entire, the lips are thick. On the n.w. coast of America from San Francisco to Sitka, species of this family are very abundant. They come into shallow water near the coasts, when the time approaches for producing their young, which is about the middle of summer. They swim in vast shoals close to the surface, and have a peculiar habit of leaping high out of the water when alarmed, of which the Indians take advantage to capture them, by striking the water violently with their paddles, and uttering yells. The terrified fish leaping out of the water, many of them fall into the canoes. The Indians also capture these fishes by thrusting a spear with four barbed points into the midst of a dense shoal. They can be easily taken by nets, but are not of great value for the table.

VIVISECTION—a term which is employed to designate operations performed with the knife on living animals, with the view (1) of increasing our physiological knowledge; (2) of confirming previously known facts; and (3) of giving dexterity in operative surgery—is a course of procedure which may be traced back to almost the earliest periods of medicine and surgery, and was largely practiced in the Alexandrian school. It is, however, only comparatively lately—about half a century ago, when the barbarous experiments of Magendie, Brachet, and other distinguished French physiologists, became known in this country—that the subject has attracted much popular notice; and during the last ten years, attention has been so specially drawn to the atrocities systematically carried on in the great French veterinary colleges at Alfort and Lyons, that a deputation of "the royal society for the prevention of cruelty to animals" laid a statement of the facts before the emperor Napoleon. When it is stated that, with the nominal object of teaching the veterinary students at Alfort to become skillful operators, six living horses were supplied to them twice a week—that sixty-four operations were performed on each horse, and that four or five horses generally died before half the operations were completed—that it takes nearly two days to go through the list—and that all the old exploded operations, as well as those now practiced, were performed—and lastly, when

it is borne in mind that most, if not all, these operations could just as instructively have been practiced on the dead animal (as is done in this country), there cannot be a doubt that a vast amount of unwarrantable and gratuitous cruelty was carried on in these establishments. Although the subject was brought before the *Académie des sciences*, and warmly discussed, the final conclusion was "that the complaints of the London society are totally without foundation; and that there is no occasion to take any notice of them." We believe that it is only by the veterinary colleges of France that the view is advocated that vivisection is necessary for the purpose of giving dexterity in surgical operations.* But while all right-minded persons—except the majority of the members of the French academy, whose votes were probably influenced by a feeling of nationality—must concur in the view, that the argument in favor of vivisection utterly breaks down, some go further, and doubt whether any experiments on living animals, performed with the object of advancing medical and surgical knowledge, and of thereby relieving, indirectly, human suffering, or prolonging human life, are, on moral grounds, to be regarded as justifiable. In opposition to this view, it is maintained that, under certain circumstances, and with due restrictions, such experiments are not only justifiable, but their performance becomes a positive duty. It may be observed that, though in stating this controversy the term vivisection is retained, the remarks apply to all kinds of experiments on living animals. It is universally admitted that man may destroy animals for his food, and to furnish him with many of the necessaries and luxuries of life; and most persons go a step further, and see no impropriety in the pursuit of field-sports. Now, as Dr. Markham argues in his excellent prize essay on this subject, in all these cases of admittedly legitimate destruction of animal life, the infliction of pain is a necessary ingredient. In some modes of destruction, the death-blow is dealt at once, and the pain is but fleeting; while in others the agony of the death struggle is equivalent to a prolonged and painful torture. An ox may be at once stunned, while the animal bled to death suffers prolonged convulsive struggles. The humanitarian, if he be a sportsman, thinks little of the lingering pain which a wounded bird or broken-legged hare undergoes; nor, if he be engaged in the whale-fishery, does he lament over the prolonged suffering which the object of his pursuit must suffer before its capture. If, then, man can legitimately put animals to a painful death in order to supply himself with food and luxuries, why may he not also legitimately put animals to pain, and even to death, for the far higher and more noble object of relieving the sufferings of humanity, and of prolonging human life? To point out what gain has accrued to physiology (and hence, indirectly, to the healing art) by experiments on living animals, would occupy many pages of this work. It is sufficient to allude to the facts, that the doctrine of the circulation of the blood, and of the existence of, and circulation through, the lacteals, was thus established, and that nearly the whole of our present knowledge of the functions of the nervous system has been thus obtained, and could never have been afforded by the most minute anatomical research, and that in consequence of the knowledge thus obtained we no longer divide a motor nerve, and thus paralyze the face, in the hope of relieving tic douloureux; while on the other hand, thanks to the researches of Brown-Sequard, Bernard, and others, we can now see our way to a more rational mode of treating epilepsy, various obscure forms of paralysis, etc. Without vivisection, we could never clearly have understood the causes of the sounds of the heart, without the knowledge of which the stethoscope would have been useless in the diagnosis of cardiac diseases; nor should we have known anything of the true nature of that mysterious disease, diabetes. The Hunterian treatment of aneurism by ligature, which has saved hundreds of human lives, was worked out by experiments on living animals. The study of anæsthetics, which, after prolonged investigation, led to the introduction of chloroform (soon, possibly, to be superseded by some even less dangerous agent), was unquestionably accompanied by the suffocation of many animals; but surely no one who can form any estimate of the vast amount of misery which has been spared to humanity by the general introduction of the use of chloroform into surgical and midwifery practice, can regret the sacrifice. Indeed, the advantage of the discovery is experienced in more ways than one upon the lower animals, since the domestic animals are subjected to its beneficent influence when surgical operations are necessary, and since, in most cases, animals subjected to physiological experiments are now usually rendered insensible by it. If such questions as—the best means of restoring to life persons apparently drowned—why chloroform sometimes kills, and how those who are suffering under apparently fatal effects can be best recovered—admit, as they doubtless must, of a solution, that solution must be sought for in experiments on living animals. These and a multitude of similar considerations which might be adduced, are sufficient, it is maintained, to lead any unbiased inquirer to the conclusion that experiments on living animals, performed with the object of advancing medical, surgical, or toxicological knowledge, and of thereby indirectly relieving human suffering, or of prolonging human life, are not only justifiable, but a matter of duty.

At the meeting of the British association held at Liverpool in 1870, the general committee requested the committee of section D (Biology) to draw up a statement of their

* *Vivisection: is it necessary or justifiable?* (1866); *Physiological Cruelty* (?) (1883).

views on physiological experiments in their various bearings, and they further requested the committee to consider "from time to time whether any steps can be taken by them, or by the association, which will tend to reduce to its minimum the suffering entailed by legitimate physiological inquiries." Accordingly, at the meeting of the association at Edinburgh in 1871, the biological committee gave in a report, in which the following resolutions were presented: 1. That no experiment which can be performed under the influence of an anæsthetic ought to be done without it; 2. That no painful experiment is justified for the mere purpose of illustrating a law or fact already demonstrated; 3. Whenever, for the investigation of new truth, it is necessary to make a painful experiment, every effort should be made to insure success, so that the suffering inflicted may not be wasted—that, therefore, no painful experiment ought to be performed by an unskilled person, or in an unsuitable place; 4. In the scientific preparation for veterinary practice, operations ought not to be performed on living animals for the purpose of obtaining manual dexterity. On the reception of this report, a standing committee was appointed for the purpose of carrying out, with all the influence of the British association, the above humane suggestions.

A still more satisfactory result, however, was the interference (following upon the report of a royal commission) of parliament, which, in the year 1876, gave its assent to a bill to amend the law relating to cruelty to animals, the purpose of which was the restriction, or better regulation, of vivisection. The provisions of this act coincide to a great extent with the resolutions of the committee as given above, and require that every one performing a painful experiment upon a living animal (which must be with a view of advancing physiological knowledge, or knowledge which will be useful for saving or prolonging life, or alleviating suffering), must hold a license from one of her majesty's principal secretaries of state. Persons holding a conditional license are allowed to perform such experiments only in a registered place, while the same rule applies to experiments performed for the sake of instruction (which, however, are permitted only under certain stringent limitations). Special protection is afforded to horses, asses, mules, dogs, and cats.

The opponents of vivisection have labored with considerable zeal for some years past to secure legislation for its total prohibition. In the United States there are only three states, New York, New Jersey, and California, in which the statutes contain any direct reference to the subject. Of these three states, the statutes of New York are the most stringent. The first bill was passed in 1867, controlling the matter in a limited degree, while in 1882 a bill was introduced for its total suppression. This bill was introduced by Mr. Henry Bergh, who has been perhaps the strongest advocate against the practice in America. In England, more has been written against it even than in America, and attempts have been made there also to force legislation towards its total abolition. Of the many advocates against its practice in England, the name of Frances Power Cobbe stands most prominent, and a bill was introduced in Parliament, in 1883, but was not passed. The *Nineteenth Century*, *Fortnightly Review*, *Popular Science Monthly*, and some other magazines for 1881–1883, contain numerous articles both for and against vivisection. A movement has been made recently to procure a license for the British Institute of Preventive Medicine, in the interests of research in bacterial growths, but the movement has not as yet met with any success.

VIZAGAPATAM', a t. of British India, capital of the district of Vizagapatam, at the mouth of the river of the same name, on the w. shore of the bay of Bengal; pop., 40,000. It is near a promontory called *Dolphin's Nose*, a mountain 1500 ft. high. It has a good harbor and a large trade. It is a military station, but being unhealthful, Europeans have retired to Waltier, 3½ m. distant.

VIZIER, or Vizir (pronounced *viz-eer'*), the title of various high functionaries in the Ottoman empire, and other Mohammedan states. The word, which is of Arabic origin, and signifies "he who bears or supports (a burden)," was first bestowed as a title of honor on the chief-minister of the first Abbaside calif, in 750 A.D. During the decline of this dynasty, the vizier had to "bear the burden" of government almost entirely, and consequently, increased so much in power and authority, that the califs thought it prudent to counteract his influence by the creation of the new dignity of *Emir-al-Omrah* (q.v.), which, being generally bestowed upon one or other of the powerful alien princes who had made for themselves sovereignties in Persia, was found to be an efficacious counterpoise. The dignity of vizier was first introduced among the Ottoman Turks during the reign of their second sultan, Orkhan, and the title was exclusively confined to the sultan's prime-minister; but in 1386, it was conferred by Amurath I. on his victorious general, Timur-tâsh, and the prime-minister's title was then changed into *vizir-a-z'hem*, "grand or illustrious vizier." From this period, the number of viziers was gradually increased, but from the commencement of the 18th c., only seven of them were ministers. The title is now given, as is also that of mujir, to all the Turkish ministers of state. The grand vizier is, after the sultan, the most important personage of the Turkish empire; he unites in his own person the whole powers of the state, and is charged with a corresponding responsibility. The political changes introduced at the end of 1876 (by which Turkey became a "constitutional" monarchy) have not seriously affected the dignity of vizier, though in 1878 the title was abolished, that of president of

the council of ministers being substituted. This dignitary, whether under the old name or the new, is, after the sultan, the most important personage of the Turkish empire, and is the head of the administration ; but he is subject, as formerly, to more serious control from the intrigues of the palace than from the new constitution.

VIZZI'NI, a. t. of Sicily, in the province of Catania, stands on a hill. It is well built, and besides containing a college and hospital, there are a number of handsome buildings and churches, containing many fine pictures. Fruits in abundance are produced, and agates are found. Pop. '81, 14,191.

VLAARDINGEN, an unwalled t. in south Holland, lies about six m. w. from Rotterdam, on the left shore of the New Maas. It has a good haven, and sends annually a large fleet of vessels to the herring-fishing, besides carrying on a considerable shipping-trade with the Mediterranean, Norway, North America, Portugal, and Spain. The pop. Jan. 1, 1880, was 9520. Besides the herring and cod fishing, and shipping-trade, the industries are: ship-building, rope-spinning, distilling gin, sawing wood, grinding corn, boiling oil, tar, etc. Vlaardingen is one of the oldest towns in south Holland, the church now called the reformed church having been consecrated by Willibrod in the 7th c., but nearly rebuilt in 1744. It was the birthplace of the poets Arnold Hoogvliet (1687–1763) and Jacob van Dijk (1745–1828).

VLADIMIR', a government of Russia, bounded on the e. by the government of Nijni-Novgorod, and on the s.w. by that of Moscow. Area, 18,864 sq. m.; pop. '92, 1,476,118. The surface is level or undulating; the soil consists chiefly of clay or sand, and is fertile only in exceptional spots. The principal rivers are the Oka and its tributaries, of which the chief is the Kliasma, a navigable stream. Of the lakes, which are numerous, but of inconsiderable size, that of Pereislav is remarkable for its productive fisheries, and is famous in history as being the cradle of the Russian fleet. After St. Petersburg and Moscow, the government of Vladimir is the most actively industrious in the Russian empire, its manufactures including cotton-yarn and cloth, chintz and dyed goods, linen, glass, the product of numerous iron and brass foundries, chemicals and paper. The inhabitants are also much employed in painting images, and in knitting stockings, which are used in Russia and Siberia. The grain-crops raised are insufficient for local consumption, and corn is imported from neighboring governments. Hemp is successfully grown, and, besides being used in considerable quantities in local manufactures, is exported to Archangel and St. Petersburg. Forests, mostly of pine, form a border round the government; but do not occur in the interior. In the 9th c., the country was inhabited by Finns; and though it was subsequently conquered and settled by the Slavonians, traces of the original inhabitants are visible in the present population.

VLADIMIR', a t. of Great Russia, capital of the government of the same name, stands on the left bank of the Kliasma, which is high and wooded, 125 m. n.e. of Moscow. It was founded in the 12th c., during the ascendency of the dukes of Vladimir, and was the capital of Russia till 1328. It contains many historical remains, as the Kreml; the "Golden Gate," built in 1158; ruins of old fortifications, and many ancient churches, notably the Uspenskij cathedral, and the cathedral of St. Demetrius; an important ecclesiastical seminary, a public library, and a theater. There are several manufactures, and a trade in corn. Cherries are a considerable local product. Pop, '94, 18,936.

VLADIMIR', the name of two celebrated Russian princes, the former of whom, Vladimir Sviatoslavitch, was the first Christian sovereign of Russia. On the death of his father (972), Vladimir, though illegitimate, received Novgorod as his share of the heritage, but was driven out by Jaropolk, who had already murdered the third brother, Oleg. However, Vladimir, by the aid of a body af Varangians (from Scandinavia), returned and overcame Jaropolk, by whose assassination (980) he became sole ruler in Russia. Disembarrassing himself of his dangerous allies by persuading them to take service with the Byzantine emperor, he next recovered by force from the Poles the provinces of which they had deprived his brother, and subdued various tribes which had recently revolted. Russia at this time was an ill-compacted empire ; the various Slavic tribes which dwelt within its boundaries acknowledged the sovereignty of the Russian princes solely by the payment of tribute, and that only when the princes were powerful enough to enforce it ; hence it was the custom for the princes personally, or their delegates, to go their regular rounds after the fashion of tax-collectors, backed up by a large armed retinue. Vladimir tried to increase the central authority, and one of the means he adopted was the erection at his capital, Kiev, of the idol Perun (Thunder), the supreme divinity of the Slaves, and of the images of other inferior deities, Slave and Finnish. But a few years more effected a remarkable change ; many of Vladimir's subjects were Greek Christians ; his mother, Olga, had become one ; besides, he wished to be allied with the Byzantine imperial family, and moved by these and other reasons of personal or patriotic ambition, he resolved to turn Greek Christian. His mode of arriving at conversion and matrimony was as curious as effective ; he first made an attack upon the Byzantine empire, then sent an embassy to Constantinople, promising peace and his conversion, in exchange for the hand of Anna, the sister of Constantine IX., threatening war in case of refusal. His demands were gladly complied with ; and after his marriage and baptism at Kherson in 988, he returned to Kiev, destroyed all the idols, and commanded his subjects to be baptized. They had not the slightest objection to be baptized, if their feared and admired prince wished it; and for days the Dnieper was

crowded with applicants for the first testing ordinance of Christianity. It could hardly have been expected that a conversion managed in such a fashion would have affected the manners and conduct of such an arbitrary, violent, and daring prince as Vladimir; yet, strange to say, from 988 he appeared to have undergone a thorough mental and moral transformation; churches were built, schools established, capital punishment was supplanted by a fine, and such excessive lenity shown to all criminals that, in the interests of good government, it was found necessary to remonstrate with the thorough-going convert. Formerly, the wisdom and valor for which he was renowned were equaled by his licentiousness, so that the chronicles had more than one reason for saying that "he was like unto Solomon;" but the strictest chastity characterized the latter part of his life; and his charity to the poor, and personal forbearance, were extreme. He died in 1014, three years after his wife Anna. The Russian church has decreed him the epithets of "saint," and "equal of the apostles."—VLADIMIR II. VSEVOLODOVITCH, surnamed *Monomachus*, grand-prince of Kiev, the great-grandson of the preceding, was born in 1053. His father being a younger son, there seemed to be little chance of Vladimir's attaining power in the ordinary course of events, in his own country; and he accordingly led a band of auxiliaries to join Boleslas II. of Poland in his wars with Bohemia; gaining such renown, as on his return ranked him at the head of Russian warriors. Vladimir's father having, as the eldest of the Russian princes, succeeded to the grand principality of Kiev (1078), Vladimir took advantage of the opportunity to wrest from their lawful possessors, Smolensk, Tchernigov, and Novgorod; though some years afterward his cousin Oleg, the dispossessed prince of Tchernigov, with the aid of the Polotzee or Cumans (a Turkish nation which was at that time the terror of the Russians), recovered his dominion. Vladimir having subsequently routed the Polotzee in several engagements, became so extremely popular that in 1112 he was chosen grand-prince of Kiev, and for 13 years he displayed his eminent qualities as a ruler and a warrior. The maintenance of internal tranquillity, the improvement of old, and the building of new towns, and the encouragement of commerce, on the one hand; and the successful campaigns against the Tchudes, Poles, Polotzee, and Bolgars (a Mohammedan commercial people settled on the Volga), on the other, are the principal characteristics of his reign. Most of Vladimir's fame, however, rests on his writings, which present an interesting picture of the internal life of Russia in the 11th c., and indicate prominently the earnest practical influence of the newly introduced Christianity. Vladimir's mother was a daughter of Constantine Monomachus; and Alexis Comnenus, who wished to be on good terms with his powerful northern neighbor, is said to have sent him the crown, scepter, and sword of his grandfather, which are still shown as such, and which are employed in the coronation of the czar.

VLADISLAS, or ULADISLAS. See LADISLAS.

VLADIVOSTOK ("Mistress of the East," Chinese *Hai-stan-wai*), seaport and chief town on the eastern coast of Asiatic Russia, situated at the southern end of the Muravjev Amurstij peninsula, between the Golden Horn bay and the bay of Amur, in 43° 7′ n. lat., 131° 54′ long. w. from Greenwich. It is the seat of government for the province, terminal station for the trans-Siberian railway, now in course of construction; and is connected by telegraph with Shanghai through Nagasaki, Japan, and with Europe by way of Siberia. It already has a commerce of considerable importance, although the exports, chiefly in the hands of the Chinese, consist mainly of edible sea-weed, dried fish, reindeer horn and trepang. Pop. '90, 14,446, of which 9365 were Russians and 4193 Chinese. As railway terminus and headquarters for the Russian navy, Vladivostok is destined to become one of the most important cities of eastern Asia.

VODENA, a beautifully-situated t. of Turkey, in the province of Saloniki, on a mountain slope, 46 m. w.n.w. of Saloniki. Water is here very abundant; torrents rush headlong down the middle of all the streets. Pop. 8000.

VOGEL, EDOUARD, 1829–56; b. Crefeld; son of Johann Karl; educated at Leipsic, studied astronomy at Berlin with Encke, and was employed to assist Hind in Bishop's observatory, Regent's park, London. In 1853 he volunteered to go to central Africa to assist in the explorations of Overweg, Barth, and Richardson; visiting lake Tchad, Kuka, Yakova (publishing some account of his discoveries in German periodicals), and penetrated into the kingdom of Waday, where, in the town of Wara, in 1856, he was killed by order of the sultan. Previous search for him having proved unsuccessful, an expedition went out, in 1860, in charge of Von Heuglin. His sister, Elise Polko, published *Erinnerungen an einen Verschollenen* (1863), containing his notes.

VOGHE'RA, a city of northern Italy, in the province of Pavia, stands on the left bank of the Staffora, in a district rich in vineyards, orchards, and corn-fields, 24 m. e.n.e. of Alessandria by railway. The Via Emilia passes through the town and divides it into two parts. There are several handsome squares. Pop. '81, 10,785.

VOGT, KARL, b. Giessen, Hesse-Darmstadt, 1817, and there studied chemistry under Liebig. In 1833 he removed to Bern, studied medicine, and, after taking a degree, devoted much time to geology and zoology under Agassiz, becoming professor of natural history at Giessen in 1847. This chair he lost on account of his share in the political movements of 1848. He went to Switzerland, and in 1852 became professor of geology at Geneva, where he remained till his death. In 1861 he took charge of an expedition to the North Cape. His course of lectures *On Man: his place in Creation and in the History of the Earth*, have been translated into English, and he published other works of

high reputation. His latest work was his *Guide to Practical Comparative Anatomy*, written in collaboration with Prof. Young and published in 1885. He is best known and will probably be best remembered as a materialist of extreme views, and one of the first exponents in Germany of Darwinism, which he expounded with singular clearness and force. He d. in 1895.

VOICE (Lat. *vox*) may be defined as an audible sound produced by the larynx, and may be produced by any animal possessing that organ; while speech or articulate language may be regarded as voice modified in the cavity of the mouth. The larynx (q.v.) is the organ by which the so-called *vocal sounds* (or primary elements of speech) are produced. In the article LARYNX, it is shown that there are two groups of muscles, which respectively govern (1) *the pitch of the notes*, and (2) *the aperture of the larynx*. Those which affect the pitch of the notes are divisible into two antagonistic sub-groups, viz., (*a*) those which depress the front of the thyroid cartilage on the cricoid, and *stretch* the vocal ligaments; and (*b*) those which elevate the front of the thyroid cartilage, and *relax* the vocal ligaments; while those which control the aperture of the glottis are divisible into (*c*) those which *open* it, and (*d*) those which *close* it. It is only the first of these groups, viz., the muscles which stretch or relax the vocal ligaments, that is concerned in the production of voice. In the ordinary condition of rest there is a wide opening between the vocal ligaments, which are in a state of complete relaxation, and the air passes freely between them. For our knowledge of the appearances presented under varying conditions by the interior of the larynx, we are mainly indebted to prof. Czermak, the inventor of the laryngoscope (q.v.); and the reader who wishes to enter fully into this subject is referred to his work on that instrument, of which a translation was published by the New Sydenham society in 1861. The movements of the arytenoid cartilages during the production of vocal sounds can be distinctly seen—the views that had been previously deduced, from theory and experiments on the dead subject, being thus confirmed by ocular proof. As soon as we wish to utter a sound, the two arytenoid cartilages raise themselves in the fold of mucous membrane which covers them, and approach one another with surprising mobility. This movement effects the approximation of the vocal cords, and consequently the contraction of the glottis. It is impossible to study with the laryngoscope the mode of formation of the gravest chest-sounds, because the arytenoid cartilages become so raised that they almost come in contact with one another, while they bend under the border of the depressed epiglottis, and thus conceal the interior of the larynx. During the emission of the most acute sounds, the glottis contracts into a mere line, on each side of which the vocal cords may be recognized by their whitish-yellow color; while further outward, and separated from the former by a narrow groove, are the false or superior vocal cords of either side. The arytenoid cartilages are raised, and come in contact in the median line, the epiglottis is drawn outward, and a short stiff tube is then formed above the glottis; all these parts being, as we learn from our sensations during the experiment, in a state of very great tension. Independently, however, of such observations as those we have recorded from Czermak's interesting memoir, any one may easily prove for himself that the aperture of the glottis is much contracted during the production of sounds by comparing the time occupied by an ordinary expiration with that required for the passage of the same quantity of air during the maintenance of a vocal sound; moreover, the size of the aperture varies with the note that is being produced, as may be readily seen by any one who compares the time during which he can hold out a low and high note. When the distance between the vocal cords exceeds one-tenth of an inch, no sound can be produced.

How the vocal cords produce sounds is a question which has long attracted the attention of physiologists and physicists. To answer it they were compared with various musical instruments. More than a century ago Ferrein (*De la Formation de la Voix de l'Homme*, 1741) compared them to vibrating *strings;* and, at first sight, there is an apparent analogy; but on further investigation (for reasons which may be found in Carpenter's *Human Physiology*, 6th ed. p. 715), this view was found to be untenable. The analogues between the organ of voice and the *flute-pipe*, in which the sound is produced by the vibration of an elastic column of air contained in a tube, were then investigated, but found to fail. The third class of instruments with which the human organ of voice has been compared are vibratory *reeds* or *tongues*, which may either possess elasticity in themselves, or be made elastic by tension. From the experiments of Weber it appears that the action of the larynx has more analogy to that of *reed*-instruments than to the instruments previously named, and though there would seem at first sight to be a marked difference between the vocal ligaments and the membranous tongue of any reed-instrument, this difference is not very great. Müller ascertained that membranous tongues made elastic by tension may have three different forms, of which the following, which alone concerns us, is one: "Two elastic membranes may be extended across the mouth of a short tube, each covering a portion of the opening, and having a chink left open between them." Here there is clearly an approximation to the human glottis, which may be increased by prolonging the membranes in a direction parallel to that of the current of air, so that not merely their edges but their whole planes shall be thrown into vibration. Prof. Willis has, upon this principle, invented an *artificial glottis*, in

which the vocal ligaments are imitated by leather, or preferably by sheet india-rubber. It is composed of a wooden pipe of the form of fig. 1, *a*, having a foot, C, like that of an organ-pipe, and an upper opening, long and narrow, as at B, with a point, A, rising at one end of it. A piece of leather or sheet india-rubber doubled round this point, and secured by being bound at D with strong thread, will form an artificial glottis, *b*, while its upper edges, G, H, are capable of vibrating or not by inclining the planes of the edges. Two pieces of cork, E and F, are glued to the corners to make them more manageable. From this machine various notes may be obtained by stretching the edges of the leather in the directions of their length, G, H; the scale of notes yielded by leather is much more limited than that yielded by india-rubber; and other observers have found that the middle coat of the arteries in a moist state (as being more elastic, and almost identical in structure with the vocal ligaments), yields more satisfactory results even than india-rubber. "It is worthy of remark," as Dr. Carpenter observes, "that in all such experiments it is found that the two membranes may be thrown into vibration, when inclined *toward* each other in various degrees, or even when they are in parallel planes, and their edges only approximate; but that the least inclination *from* each other (which is the position the vocal ligaments have during the ordinary state of the glottis) completely prevents any sonorous vibrations from being produced."—*Op. cit.*, p. 718. The *pitch* of the notes produced by membranous tongues may be affected in various ways (as by increasing the strength of the blast, the addition of a pipe, etc), and is mainly governed by their degree of tension, while the foregoing statements show that the sound of the voice is the result of the vibrations of the vocal ligaments which take place according to the same laws with those of elastic tongues generally. Little is, however, known with certainty regarding the mode and degree in which the tones are modified by the shape of the air-passages generally, the force of the blast of air, and other circumstances.

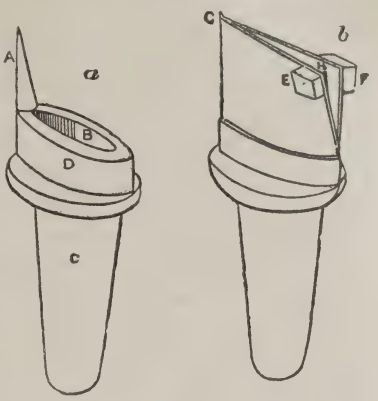


Fig. 1.

The *falsetto* is a peculiar modification of voice, differing from the ordinary or *chest voice*, not only in the higher pitch of the notes, but also in their quality. The theory of its production is still an open point, into which we have not space to enter further than to remark that, according to prof. Wheatstone, falsetto notes are to be explained by supposing that "the column of air in the trachea may divide itself into *harmonic lengths*, and may produce a *reciprocation* of the tone given by the vocal ligaments."

The pressure of the air within the trachea during the production of voice is very considerable. From observations made by Cagniard-Latour on a man with a fistulous opening in the trachea, it was found that, when the patient called out at the top of his voice, the pressure was equal to that of a column of water 38 in. in height; when he spoke at his usual pitch, to one of 5 in.; and, when he sang in a high note, to one of about 8 inches. The glottis has been well chosen by Dr. Carpenter to illustrate the minute precision with which the degree of muscular contraction can be adapted to the desired effect. The musical pitch of the tones produced by it is, as we have shown, regulated by the degree of tension of the elastic vocal ligaments. Their average length, in a state of repose, is $\frac{7\,3}{1\,0\,0}$ of an inch; while in the state of greatest tension it is about $\frac{9\,3}{1\,0\,0}$—the difference being thus *one-fifth* of an inch; while in the female the respective lengths are $\frac{5\,1}{1\,0\,0}$ and $\frac{6\,3}{1\,0\,0}$ respectively—the difference being thus about *one-eighth* of an inch. Now the natural compass of the voice, in persons who have cultivated the vocal organ, is about two octaves, or 24 semitones. Within each semitone an ordinary singer could produce at least 10 distinct intervals (the celebrated Mme. Mara could sound 100 different intervals between each tone, the compass of her voice being 21 tones), so that 240 is a very moderate estimate of the number of different states of tension of the vocal cords, every one of which can be produced at will; and the *whole* variation in the length of the cord being not more than one-fifth of an inch, even in man, the variation required to pass from one interval to another will not be more than $\frac{1}{1\,2\,0\,0}$ of an inch (while in such a case as that of Mme. Mara the distance would be reduced to $\frac{1}{1\,7,0\,0\,0}$ of an inch).

In the production of vocal sounds, the delicate adjustment of the muscles of the larynx, which is requisite to the evolution of determinate tones, is directed by the sense of hearing, being originally learned under the guidance of the sounds actually produced; but "being subsequently effected voluntarily, in accordance with the mental conception of the tone to be uttered, which conception cannot be formed unless the sense of hearing has previously brought similar tones to the mind. Hence it is that persons who are born *deaf* are also *dumb*. They may have no malformation of the organs of speech, but they are incapable of uttering distinct vocal sounds, or musical tones, because they have not the guiding conception, or recalled sensation, of the nature

of these. By long training, however, and by imitative efforts directed by muscular sensations in the larynx itself, some persons thus circumstanced have acquired the power of speech; but the want of a sufficiently definite control over the vocal muscles is always very evident in their use of the organ."—*Op. cit.*, p. 556. A fund of interesting matter in connection with this subject may be found in Dr. Kitto's *Lost Senses*. Although not born deaf, he became *completely* so in early childhood, in consequence of an accident. His voice became similar to that of a person born deaf and dumb, and taught to speak. It was observed that the words which he had been accustomed to use before his accident, were still pronounced as they had been in childhood, the muscular movements concerned in their production having been still guided by the original auditory conception, while all the words subsequently learned were pronounced according to the spelling.

The various muscular actions which are concerned in the production of vocal tones, are commonly regarded as being under the influence of the will. It is, however, easy to show that this is not the case. We cannot, by simply *willing* to do so, raise or depress the larynx, or move one cartilage of it toward or from another, or extend or relax the vocal ligaments; although "we can readily do any or all of these things by an act of the will, exerted for a specific purpose. We conceive of a tone *to be* produced, and we *will* to produce it; a certain combination of the muscular actions of the larynx then takes place, in most exact accordance with one another, and the predetermined tone is the result. This anticipated or conceived sensation is the guide to the muscular movements, when as yet the utterance of the voice has not taken place; but while we are in the act of speaking or singing, the contractile actions are regulated by the present sensations, derived from the sounds as they are produced." From these remarks, in which Dr. Carpenter has placed a very difficult subject in as clear a light as the subject admits of, it follows that the muscular actions which are concerned in the production and regulation of the voice, are due to an *automatic* impulse, similar to what occurs in the movements of the eyeball, and in many other cases that might be adduced. There cannot be a doubt that the simple utterance of sounds is in itself an instinctive action; although the combination of these sounds into music or into articulate language, is a matter of acquirement.

Having explained the way in which the larynx produces those *tones* of which the voice fundamentally consists, and the sequence of which becomes *music*, we come to the subject of *speech*, which consists, in the modification of the laryngeal tones by other organs superior and anterior to the larynx (as the tongue, the cavity of the fauces, the lips, teeth, and palate, with its velum and the uvula acting as a valve between the throat and nostrils), so as to produce those *articulate sounds* of which language is formed. The organ of voice is thus capable of forming a large number of simple sounds, which may be combined into groups, forming words. Vocal sounds are divided into vowels and consonants. When a vowel is pronounced what happens? This question is thus answered by Prof. Max Müller: "Breath is emitted from the lungs, and some kind of tube is formed by the mouth, through which, as through a clarionet, the breath has to pass before it reaches the outer air. If, while the breath passes through the vocal cords, these elastic *laminæ* are made to vibrate periodically, the number of their vibrations determines the pitch of our voice, but it has nothing to do with its *timbre*, or vowel. What we call vowels are neither more nor less than the qualities, or colors, or *timbres* of our voice, and these are determined by the form of the vibrations, which form, again, is determined by the form of the buccal tube."—*Lectures on the Science of Language*, 2d series, p. 116. This writer enters very fully into the various configurations of the mouth requisite for the formation of the different vowels. (1.) In pronouncing *u* (the vowels are all understood to be pronounced as in Italian), we round the lips, and draw down the tongue, so that the cavity of the mouth assumes the shape of a bottle without a neck. (2.) If the lips are opened somewhat wider, and the tongue be somewhat raised, we hear the *o*. (3.) If the lips are less rounded, and the tongue somewhat depressed, we hear the *a* of the northern languages (as in *august*). (4.) If the lips are wide open, and the tongue in its natural flat position, we hear *a*. (5.) If the lips are fairly open, and the back of the tongue raised toward the palate, the larynx being raised at the same time, we hear the sound *e*. (6.) If we raise the tongue higher still, and narrow the lips, we hear *i*. The buccal tube here represents a bottle with a very narrow neck, of no more than six centimeters (or about 2¼ in.) from palate to lips. Diphthongs arise when, instead of pronouncing one vowel directly after another with two efforts of the voice, we produce a sound *during* the change from one position to the other, that would be required for each vowel. Though the tube of the mouth thus modified by the tongue and lips is the chief agent in the production of vowels, Czermak has proved that the *velum palati* is changed in position with each vowel, and that it is lowest for *a*, and rises successively with *e*, *o*, *u*, and *i*, when it reaches its highest point. He likewise found that the cavity of the nose is more or less opened during the pronunciation of certain vowels. Languages might have been formed entirely of vowels, but the existing words, consisting solely of vowels, show how unpleasant such languages would have been. Something else was obviously wanted to supply what Max Müller happily terms *the bones of language*—namely, the consonants. These are commonly divided into (1) those which require a total stoppage of the breath at the moment previous to their being produced,

and which cannot, therefore, be prolonged; and (2) those in pronouncing which the interruption is partial, and which, like the vowel sounds, can be prolonged at pleasure. The former are termed *explosive*, and the latter *continuous*, consonants. In pronouncing the *explosive* consonants, the posterior openings of the nostrils are completely closed, so as to prevent the passage of air through the nose, and the current may be checked in the mouth in three ways—viz. (*a*) by the approximation of the lips; (*b*) by the approximation of the point of the tongue to the front of the palate; and (*c*) by the approximation of the middle of the tongue to the arch of the palate. The letters *b* and *p* are pronounced by the first of these modes; *d* and *t* by the second; and *g* (hard) and *k*, sounded as *key*, by the third; the difference between *b*, *d* and *g*, on the one hand, and *p*, *t* and *k*, depends upon the approximating surfaces being larger, and the breath being sent through them more strongly at the moment of opening in the former than in the latter group. The *continuous* consonants may be subdivided into three classes, according to the degree of freedom with which the air is allowed to escape, and the compression which it consequently experiences. In the *first* class no air passes through the nose, and the parts of the mouth that produce the sound are closely approximated, so that the compression is considerable. This is the case with *v* and *f*, *z* and *s*, *d* and *t*, *th*, *sh*, etc., the movement of the tongue being also concerned in the production of several of these sounds. In the *second* class, including *m*, *n*, *l*, *r*, the nostrils are not closed, and, consequently, the air is scarcely at all compressed. In pronouncing *m* and *n*, the breath passes through the nose alone; *m* is a labial, like *b*, but the latter is formed with the nose closed. Hence the passage of *m* to *b* (as in *lamb*) is easy: so also is that from *n* to *t*, or from *n* to *g*, as is seen in the frequent combination of *nt* and *ng* in most languages. The sounds of *l* and *r* (letters which Max Müller places in a special group under the name of trills) are produced, according to Helmholtz, as follows: "In pronouncing *r*, the stream of air is periodically entirely interrupted by the trembling of the soft palate, or of the tip of the tongue, and we then get an intermittent noise, the peculiar jarring quality of which is produced by these very intermissions. In pronouncing *l*, the moving soft lateral edges of the tongue produce, not entire interruptions, but oscillations in the force of air."—*Die Lehre von den Tonempfindungen*, 1863, p. 116. The *third* class contains sounds which scarcely deserve to be called consonants, since they are merely *aspirations*, either simple, or modified by an elevation of the tongue, causing a slight obstruction to the passage of air, and an increased resonance in the back of the mouth. The present *h* and the Greek *χ* are examples of these sounds.

For further details, the reader is referred to the admirable chapter on "Voice and Speech" in Carpenter's *Human Physiology*, and to Max Müller's *Lectures on the Science of Language* (from both of which we have borrowed largely in this article), to Mr. Bishop's article "Voice" in the *Cyclopædia of Anatomy and Physiology;* and the various works of Funke, Helmholtz, Brücke, Czermak, Du Bois Reymond, etc., mentioned by Max Müller in his chapter on "the Physiological Alphabet."

VOIDED, in heraldry, a term applied to an ordinary when its central area is removed, so that the field is seen through it, and little but a mere outline remains.—Azure, a saltire voided argent.

VO'LANT, in heraldry, flying.

VOLANTE, a cumbrous two-wheeled vehicle, in common use in the streets of Havana. It admits of but two, or at most three occupants, and the horse which drags it is usually driven by a negro "calesero" or coachman, who rides on another horse fastened to the whiffletree by a pair of traces. The volante, of late years, has lost much of its popularity, and there are signs that it may entirely disappear.

VOLAPÜK (*vol*, world, and *pük*, language), the invention of Rev. Father Johann Martin Schleyer, a Roman Catholic priest, b. in Ober-Lauda, Baden, but now a resident of Constance. Father Schleyer began his labors in 1878, and in 1879 published a grammar and dictionary, but it was not till 1884 that societies for the study of V. were formed outside of Germany and Austria. In 1885 V. was introduced into France by Prof. Auguste Kerckhoffs, who improved and simplified it, and its use has extended so rapidly that a number of periodicals are now published in the language. The characteristics of the grammar are regularity and simplicity, and it may be learned in a few days. Schleyer's dictionary contains only 13,000 words. About one-third of the words are derived from English and French roots, and root-words are mostly monosyllabic. The alphabet contains 8 vowels and 19 consonants. There are four cases: the genitive, dative, and accusative being made by adding the vowels *a*, *e*, *i* to the nominative (*dom*, a house, *doma*, of the house); the plural invariably ends in s. Verbs are active, passive, and reflective, and the root is generally a substantive (*pük*, language, *pükon*, to speak). Articles are omitted; adjectives, verbs, and adverbs are regularly formed from the substantive, and have invariably the same termination. There are no artificial genders, no irregular verbs, and there is but a single conjugation. The promoters of V. hold frequent congresses. There is a general association of which Schleyer is head (*cifal*), an academy, under Kerckhoffs, and a central organ, published at Constance.

VOLCA'NOES are openings in the earth's crust from which various kinds of matter in a highly heated condition are ejected, such as gases, steam, ashes and cinders, masses of solid rock, and molten rock called lava. The heavier portions of the materials thus ejected fall back within and around the vent, thus in time building up the hilly or mountainous cones by which volcanoes are in general distinguished. The depression

in the top of these conical formations is called the crater; and the appearance of burning and of vomiting forth flame and smoke, peculiar to volcanoes in action, is not caused by external combustion, but is simply the fiery reflection thrown upon the ascending volumes of steam and vapor from the incandescent materials within the vent. Volcanic structures are likewise formed in the ocean. In 1796 a column of smoke was seen to rise from the Pacific ocean about 30 m. to the n. of Unalaska. The ejected materials having raised the crater above the level of the water, flames issued from the islet, which illuminated the country for 10 m. around. Six years afterward, when a few hunters landed on the new island, they found the soil in some places so hot that they could not walk upon it. Repeated eruptions have increased the dimensions of the island, until now it is several thousand feet in height, and between 2 and 3 m. in circumference. In the same region is the volcanic island of Kliutschewsk, which rises at once from the sea to the enormous height of 15,000 feet.

The lava, scoriæ, and ashes which are thrust out of the crater form highly inclined and more or less regular beds on the surface of the mountain, extending from the crater-mouth to varying distances down the sides of the volcano. This method of increase gives the uniform conical outline to volcanoes, without the terraces or breaks which are found in almost all other mountains. The sides are often furrowed longitudinally by straight narrow ravines, which increase in number toward the base. These are produced by the action of running water obtained from rain or from melting snows during an eruption. The rapidity with which floods rush down the steep sides of a volcano gives a prodigious force, which the loose scoriæ and ashes, and even the solid lava, cannot resist.

The grayish color of volcanic mountains is produced by the ash and scoriæ, which, though in composition the same as the dark lava, have this lighter color from the minute subdivision of their particles. When a particular series of rocks remain on the surface, and are not covered by the products of more recent eruptions, they weather and decompose, and produce a very fertile soil, which is speedily clothed with vegetation, and thus change the whole aspect of the formerly bare and uniformly-colored mountain.

The vent through which the materials are vomited forth is called the crater. This is a more or less circular opening, communicating with the source from which the ejected materials are obtained. The crater has generally one side much lower than the other—that from which the prevailing wind blows, which carries with it the showers of ashes to the opposite side of the mountain. In many cases, the cone is truncated; a wide hollow of immense extent, and often of great depth, in the base of which the crater is situated, occupies the summit. The Spanish name *caldera* is technically applied to these hollows. Their origin has been a subject of considerable controversy. Von Buch and others maintain that they are craters of elevation; that is, that the rocks were originally spread out in nearly horizontal deposits, and then upheaved into a dome-shaped mountain, with the hollow caldera in the center of its summit. The more satisfactory explanation is that the original cone, formed by the alternate deposition of the lava and ashes ejected from the crater, has, from the great heat of the molten lava rising in the tube of the volcano, or from gaseous explosions, given way, and fallen in. The cones both of Etna and Vesuvius have frequently fallen in and been reproduced. In 1822 the summit of Vesuvius was reduced by 800 feet. The immense size of some calderas seems, however, opposed to this theory. That of the island of Palma, one of the Canaries, is from 3 to 4 geographical m. in diameter, and the precipices which surround the cavity are from 1500 to 2,000 ft. in vertical height. They form an unbroken wall, except at the south-western end, where a deep gorge permits the passage of the torrent which drains the caldera. The precipices are traversed by numerous vertical dikes, and exhibit all the appearances which would be produced by the falling-in of the huge summit of this once enormous volcano.

The pressure of the incandescent lava often forces for itself a passage to the surface before it reaches the mouth of the crater, and this is more frequently the case when the volcanic eruption is accompanied with earthquakes. Immense vertical fissures are found radiating from the center of the volcanic action, and reaching the surface of the ground, and even rising to the summit of the mountain; these being filled with the molten rock, which in course of time solidifies and forms often a large portion of the mountain mass, as is shown in the Val del Bové on Etna (q.v.). The lava sometimes pours out of these fissures instead of rising to the crater. In 1783 during a terrible eruption of Hecla, a prodigious stream of lava flowed from a lateral crevice; moving slowly down the mountain-side, it reached a distance of 50 m. in 42 days; it then branched into two main streams, the one running 40 m. and the other 50 m. further toward the sea. Its depth varied from 600 to 1000 ft., and its greatest width was 15 miles. The amount of lava poured out into this stream would almost equal Mont Blanc in bulk.

The power which exhausts itself in the eruption of a volcano often shows itself by changes which it produces in the level of the country around. About a hundred years ago, a volcano appeared in the center of the great table-land of Mexico, and raised an area of nearly 4 sq.m. 550 ft. higher than it was before, covering it at the same time with conical hills of various heights, the highest of which is Jorulla, which is 1600 ft. high. But sometimes a subsidence takes place. In 1772 a great part of the Papandayang, a mountain in Java, was swallowed up; the inhabitants of its declivities were sud-

denly alarmed by tremendous noises in the earth, and before they had time to retire, the mountain began to subside, and soon disappeared. The area thus sunk was 15 m. long and 6 broad.

A volcanic eruption is generally preceded by rumbling noises and slight movements in the earth; then fitful puffs of gases and steam are given off. These contain much sulphur; and some volcanoes give out such quantities of carbonic acid and other mephitic gases as to destroy the animals in the neighborhood. See Upas. The eruption itself begins, perhaps, with the ejection of the finest dust, and that with such a force as to project it high into the atmosphere, where, taken up by air-currents, it is often carried to enormous distances. In 1845, the dust from Hecla was in ten hours thickly deposited on some of the Orkney and Shetland islands; the ashes from Conseguina fell, in 1835, on the streets of Kingston, Jamaica, at a distance of 700 m.; and during the same eruption, the fine dust covered the ground at a distance of 30 m. to the s. of the volcano, to a depth of more than 10 ft. During or after the stupendous eruption of the volcano on the island of Krakatoa, in the Straits of Sunda (which was accompanied by a destructive earthquake wave that swept the shores of Sumatra and Java), dust and mud were thickly deposited over an enormous area. Remarkable solar phenomena in Ceylon, South Africa, Brazil, and elsewhere, were attributed to the presence in the upper atmosphere of volcanic dust from this source; and, in the U. S., deeply-colored skies before sunrise and after sunset, months after the eruption, were held to be due to the same cause. Sediment left, in Europe, on windows after rain, and on snow, was chemically tested, and found unmistakably to contain volcanic dust.

The flames seeming to issue from the crater are usually the reflection of the glowing lava emitted from the crater, and illuminating the clouds of vapor and ashes.

Lava and scoriæ are at last vomited forth. Sir William Hamilton says that, in 1779, the jets of liquid lava from Vesuvius, mixed with scoriæ and stones, were thrown to a height of 10,000 feet, giving the appearance of a column of fire. The lava, however, generally issues from openings in the side of the mountain. It pours forth in a perfectly liquid state, bright and glowing with the splendor of the sun. At first, it flows rapidly; but as its surface becomes cooled and converted into slag, its velocity diminishes. It has to burst the indurated coating before it can continue its progress, and the liberated lava when it flows bears on its surface masses of scoriæ, looking like the slag from an iron furnace.

The mineral and chemical constituents of the various materials ejected by volcanoes have recently been carefully studied, and much valuable information on this and the kindred subject of the causes of volcanic action will be found in Prof. Judd's work, *Volcanoes: What they are and what they teach.*

The theories propounded to account for volcanic action are either chemical or geological. Sir H. Davy suggested that if immense quantities of the metallic bases of the earths and alkalies were present in the interior of the earth, all the phenomena would be produced by their oxidization from contact with air or water. Although the distinguished author of this theory abandoned it, it has since been taken up and advocated by Daubeny and others. Bischof, assuming that the interior of the earth consists of a highly heated and fused mass, considers that the mechanical action of water, converted into steam by the great heat, would produce volcanic action. Both theorists seek support for their views from the fact, that the great majority of volcanoes are situated on or near the sea-coast. Geologists accepting also the doctrine of internal heat, and believing that at a certain depth the rocks of the earth are, partially at least, in a state of fusion, explain volcanoes by considering them as connections established between the interior of the earth and the atmosphere, the elastic force of steam being the propelling power. Darwin, from observations made in all parts of the world, believes that volcanoes are chiefly, and, indeed, almost only, found in those areas where subterranean motive-power has lately forced, or is now forcing upward, the crust of the earth, and are invariably absent in those where the surface has lately subsided, or is still subsiding.

Volcanic action is limited to particular regions of the earth. In these regions, the active vents are distributed at intervals, and are generally arranged in a linear direction. The Pacific ocean is bounded by an almost unbroken line of active volcanoes. Beginning in the New South Shetlands, where there is an active volcano in lat. 62° 55′ s., we pass to Terra del Fuego, and then on to the Andes, which are throughout their whole course volcanic, although the great centers of present action are confined to Chili, Peru, the neighborhood of Quito, Guatemala, and Mexico. The line is continued northward by the burning mountains of north-western America, and the Aleutian islands carry the chain across to Kamtchatka on the Asiatic side. Here, turning southward, the line may be traced through the Kurile islands, Japan, Formosa, the Philippines, Moluccas, New Guinea, and the Salomon and New Hebrides groups, to New Zealand. From Celebes, a branch proceeds in a north-westerly direction through Java and Sumatra, to Barren island in the bay of Bengal; and even beyond this we find a region in northern India subject to earthquakes, which may lead us, on the one hand, to the volcanic region in Tartary, or, on the other, through Asia Minor to the Greek archipelago, Sicily, Naples, and on to the Canaries and cape de Verd. According to the geological theory, the lines thus traced over the globe would represent rising lands, where the crust is less strong, and so less liable to repress the expansive powers below. There are a number of isolated volcanoes also scattered over the surface of the earth. These are supposed to have opened a star-shaped communication with the interior. The most remarkable of

these isolated volcanoes are Jan Mayen, in lat. 70° 49′ n., and those in Iceland in the north, and mount Erebus in s. Polarland, in lat. 77° 32′ s.

The volcano is a conspicuous object of scientific inquiry, inasmuch as its action embraces all the phenomena connected with the expulsion of heated materials from the interior of the earth to the surface. Volcanoes may break through any kind of geological formation. In Auvergne, in the miocene period, they burst through the granitic and gneissose plateau of central France; in the period of the lower old red sandstone they pierced Silurian rocks in Scotland; in the late tertiary and post-tertiary ages they found their way through the marine strata, and formed such huge piles as Etna and Vesuvius; on the banks of the Rhine they have penetrated some of the older alluvia of the river. In many instances new volcanoes have appeared on the site of old ones. In Scotland the carboniferous volcanoes have risen on the sites of those of the old red sandstone. Somma and Vesuvius have arisen from the great Neapolitan plain of marine tufa. It is usual to class volcanoes as active, dormant, and extinct. The active volcano cannot be mistaken; but in many cases it is impossible to determine whether a volcano is extinct or only dormant. The volcanoes of the Silurian age in Wales, of the carboniferous age in Ireland, of the Permian age in the Hartz, and of the miocene age in the Hebrides, are certainly extinct. But the miocene volcanoes of Iceland are still represented by Skaptar-Jökull and Hecla. Somma, in the first century of the Christian era, would have been regarded as an extinct volcano; its fires had never been known to have kindled; its vast crater was a wilderness of vines and brushwood, the haunts of the wild boar and the wolf. Yet in the autumn of the year 79 A.D., half of the wall of the crater was blown out by a series of terrific explosions, the present Vesuvius was formed within the limits of the old crater, and the cities of Pompeii and Herculaneum were buried. From that day to the present the volcano has been active, although there have been long intervals of quiet. Between the years 1500 and 1631 it was entirely dormant, and the crater was overgrown with vines and brushwood. Near the close of 1631, however, there came an eruption never equaled except by the one of 79.

The materials thrown up by volcanic action are: 1. Gases; 2. Lavas; 3. Fragmentary substances. Gases and vapors are the earliest development, and steam is the most abundant of all. In great eruptions it rises in enormous quantities and rapidly condenses into rain. It has been calculated that in a hundred days Etna threw up enough vapor to make 200,000,000 barrels of water. This vapor is mixed with various materials, the most abundant being sulphureted hydrogen, which is the chief cause of the deposits of sulphur around vents. At Vesuvius and some other volcanoes hydrochloric acid appears. Carbonic acid is sometimes given off so abundantly that birds and small animals have been suffocated by it. Nitrogen has also been detected. With these gases and vapors are associated many substances which, sublimated by the volcanic heat, appear as deposits along crevices and surfaces where they reach the air and are cooled. These are sulphur, sal-ammoniac, specular iron, oxide of copper, boracic acid, and the chlorides of sodium, iron, copper, and lead. The chloride of sodium is sometimes so abundantly deposited as to form valuable mines of salt. Among the phenomena of volcanic action may be mentioned the abundant discharge of water. The sources of such water are melting snow, the condensation of the great volumes of steam, and the disruption of reservoirs of water in subterranean recesses. The volcanoes of South America often throw up great quantities of dead fish, which seems to indicate a connection with the ocean. There is a volcano in Guatemala that throws out nothing but water. In one of the volcanoes of Java there is a hot steaming lake of acid water. Early in 1817 an eruption took place by which great destruction was caused. After the explosion the temperature of the water in the basin was greatly reduced. Sometimes the water and the dust are thrown up united and form what are known as mud volcanoes; but these are rare.

One of the greatest products of volcanic action is lava, by which is meant the molten matter which flows from the mountain. When cooled, lava is a light porous stone of sp.gr. 2.37 to 3.22, containing a variety of mineral substances. Lavas differ greatly in texture; some are crystalline, some are half glassy or stony; others are vitreous. They also vary in color and in general external aspect. Their surface is commonly rough and rugged until it has been sufficiently decomposed to crumble into excellent soil, which, under favorable circumstances, will support a luxurious vegetation.

Volcanic action may be either constant or periodic. Stromboli in the Mediterranean has been uninterruptedly emitting hot stones, steam, and lava from the dawn of history. Other constant volcanoes are known in the Moluccas and the Friendly Islands. The cone of Sangay in Quito perpetually gives off hot vapors, and Cotopaxi in Mexico is constantly active. But the general rule is that a volcano has intervals of greater or less fury, and followed by intervals of quiescence. The eruptions of Vesuvius are often preceded by a failure or diminution of the wells and springs in the neighborhood; but more frequent indications of an approaching outburst are conveyed by sympathetic movements of the ground beneath. Rumblings and groanings are heard from below; slight tremors succeed, increasing in frequency and violence till they become distinct earthquake shocks. The vapors from the crater rise more abundantly into the air. All this time the lava column in the pipe or funnel of the volcano has been slowly ascending, forced upward and kept in perpetual agitation by the passage of the elastic vapors through its mass. After a long interval of quiescence has elapsed, the vent may contain much solid lava which will confine the melted part beneath. A vast pressure is thus

exerted on the sides of the cone. Should these be too weak to resist, they will open in one or more rents, and the liquid lava will issue from the outer slope of the mountain; or the energies of the volcano will be directed toward clearing the obstruction in its throat, until, with tremendous explosions, and vast clouds of dust and fragments, the bottom and sides of the crater are blown out, and the top of the cone disappears. The lava may now pour over the lowest part of the lip of the crater, while, at the same time, immense quantities of red-hot bombs, scoriæ, and stones are shot up into the air, most of them falling back into the crater, but many descending upon the outer slopes of the cone, and some even upon the country beyond the base of the mountain. The lava rushes down at first like a river of molten iron, but, as it cools, its rate of motion lessens. Clouds of steam rise from its surface, as well as from the central crater. Indeed, every successive paroxysmal convulsion of the mountain is marked, even at a distance, by the rise of huge ball-like wreaths or clouds of steam mixed with dust and stones, forming a vast column which towers sometimes a couple of miles above the summit of the cone. By degrees these diminish in frequency and intensity. The lava ceases to flow, the shower of stones and dust dwindles down, and after a time, which, with the same mountain, may vary from hours to days or months, the volcano becomes tranquil.

The violence of volcanic explosions is remarkable. The history of the cone of Vesuvius brings before us a long series of such explosions beginning with that in 79 A.D., which was the greatest known in human history. Even now, in spite of all the ashes and lava poured out during the last 1800 years, it is easy to see how stupendous must have been that explosion by which the southern half of the crater was blown out. At every successive important eruption a similar operation takes place within the present cone. The hard cake of lava forming the floor is burst open, and with it there usually disappears much of the upper part of the cone, and sometimes, as in 1872, a large segment of the crater wall. In 1538 a new volcano was formed on the shores of the bay of Naples. A cavity was made by successive explosions and such quantities of stones, scoriæ, and ashes thrown from it as to form a hill 440 ft. above the sea level and more than 8,000 ft. in circumference. Showers of dust and stones are a conspicuous feature of volcanic eruptions. Instances are known where stones eight pounds in weight have passed through enormous parabolic curves in the air and fallen at a great distance. Such stones are found in the ashes that entombed Pompeii. But in many great eruptions, besides a constant shower of stones and scoriæ, a vast column of exceedingly fine dust rises out of the crater, sometimes to the height of more than a mile, and then spreads outward like a sheet of cloud. So dense sometimes is this dust-cloud that the sun is obscured, and for days together the darkness reigns for miles around the volcano. In 1822 this was the case at Vesuvius, the ashes not only falling thickly on the villages around the base of the mountain, but traveling as far as Ascoli, 56 Italian m. from the mountain on one side, and to Casona, 105 m. away on the other side. But probably the most stupendous outpouring of volcanic ashes on record was that which took place after a quiescence of 26 years from the volcano of Conseguina, in Nicaragua, during the early part of 1835. On that occasion utter darkness prevailed over a circle of 70 m. in diameter, the ashes falling so thickly that even 24 m. from the mountain they covered the ground to a depth of 10 ft. It was estimated that the rain of dust and sand fell over an area of 270 geographical m. in diameter. Some of the finer materials thrown so high as to come within the influence of the upper air current were blown away to the e. and fell four days afterward on the island of Jamaica, 700 m. away. Bombs, slags, and lapilli may be thrown up when the volcano is comparatively quiet, but dust-showers are always discharged with violence. Thus in the constant but comparatively quiet action of Stromboli the column of the lava in the pipe may be seen rising and falling with a slow rhythmical motion. At every rise the surface of the lava swells up into blisters several feet in diameter which by and by burst with a sharp explosion that makes the walls of the crater vibrate. A cloud of steam rushes out, carrying with it hundreds of fragments of the glowing lava, sometimes to the height of a quarter of a mile. It is by the ascent of steam through the mass that a column of lava is kept boiling at the bottom of the crater, and by the explosion of successive larger bubbles of steam that the various bombs, slags, and fragments of lava are torn off and tossed into the air. It has often been noticed at Vesuvius that, after each great concussion, a huge ball-like cloud of steam rises from the crater. Doubtless it is the sudden bursting of that steam which causes the explosion. Explosions and accompanying scoriæ are abundant in Vesuvius, where the lavas are comparatively viscid; but they are almost unknown at Kilauea, where the lava is remarkably liquid.

No part of the operations of a volcano has greater significance than the ejection of such enormous quantities of fragmentary matter. In these deposits are buried trees, the bodies of animals, and the works of man. Besides the distance to which fragments may be hurled by volcanic explosion, or to which they may be diffused by the air, we have to take into account the vast spaces across which the finer dust may be borne by upper aerial currents. On several occasions ashes from Icelandic volcanoes have fallen so thickly between the Orkney and the Shetland islands that vessels there at sea have had the strange deposits shoveled off their decks. In 1783 Skaptar-Jökull ejected so much fine dust that the atmosphere of all Iceland was loaded with it for months afterward. It fell in such quantities over Caithness, a distance of 600 m., as to destroy the crops, and the period is still remembered in Scotland as "the year of

the ashie." Traces of the same deposit were observed as far as Holland. It is not therefore to be held that a volcanic deposit indicates proximity to a volcanic center, since it may have drifted from another center hundreds of miles away.

Lava streams usually consist of glass through which are diffused microlites; and well-defined crystals of leucite may be seen in specimens of Vesuvius lava which have been dipped from a white-hot stream and suddenly congealed. The green pyroxenic lava of Hawaii exhibits so extreme a degree of fluidity that, during its ebullition in pools of the crater, jets not more than a quarter of an inch in diameter are tossed up, and falling back on one another, make a column of "hardened tears of lava," while in places the jets thrown up and blown aside by the wind give rise to long threads of glass which lie thickly together like mown hay. The natives call this "Pele's hair," after one of their divinities. At its first appearance, where it issues from the mountain, the lava glows with a white heat, and flows with a motion which has been compared to that of honey or of melted iron. It soon becomes red, and, like a coal fallen from a hot fireplace, rapidly grows dull as it moves along, until it assumes a black, cindery aspect. At the same time the surface congeals, and soon becomes solid enough to support a heavy block of stone. Its aspect depends, not merely on the composition and fluidity of the lava, but on the point of egress, whether from the crater or from a fissure, on the form of the ground, the angle of slope, and the rapidity of flow. Lavas which have been kept in ebullition within the central chimney are apt to acquire a rough cellular texture. The surface of the moving stream breaks up into rough brown or black cinder-like slags, and irregular rugged cakes, which, with the onward motion, grind and grate against each other with a harsh metallic sound, sometimes rising into rugged mounds or becoming seamed with rents and gashes, at the bottom of which the red-hot glowing lava may be seen. When lava escapes from a lateral fissure it may have no scoriæ, but its surface will present froth-like, curving lines, as in the scum of a slowly flowing river, or will be arranged in curious ropy folds as the layers have successively flowed over each other and congealed. These and many other fantastic coiled shapes were exhibited by the lava which flowed from the side of Vesuvius in 1858. A large area which has been flooded with lava is perhaps the most hideous and appalling scene of desolation anywhere to be found on the surface of the globe. A lava stream at its point of escape from the side of a volcanic cone occupies a comparatively narrow breadth; but it usually spreads out as it descends, and moves more slowly. The sides of the moving mass look like huge embankments, or like some of the large mounds of "clinkers" one sees in a manufacturing district. The advancing end of the mass is often much steeper, creeping onward like a great wall or rampart, down the face of which the rough blocks of hardened lava are ever rattling. The rate of movement is regulated by the fluidity of the lava, by its volume, and by the form and inclination of the ground. Hence, as a rule, a lava-stream moves faster at first than afterward, because it has not had time to stiffen, and its slope of descent is considerably steeper than further down the mountain. One of the most fluid and swiftly-flowing lava streams ever observed on Vesuvius was thrown out Aug. 12, 1805. It is said to have rushed down a space of 3 Italian (3⅜ English) m. in the first 4 minutes, but to have widened out and moved more slowly as it descended, and finally to have reached Torre del Greco in 3 hours. A lava stream thrown out by Mauna Loa in 1852 went as fast as an ordinary stage-coach, or 15 m. in 2 hours. Long after a current has been deeply crusted over with slags and rough slabs of lava it continues to creep slowly forward for weeks or even months. The hardened crust of a lava current is a poor conductor of heat. In the case of Jorilla, a volcano in Mexico, lava was sent out in 1759, and 21 years afterward cigars could be lighted at the fissures in the deposit; after 44 years the lava still sent up steam, and after 87 years two vapory columns were still rising. No sure means have been found to ascertain the temperature of lava at the moment of discharge; but the slow rate of cooling has been regarded as of high geological significance in regard to the cooling and probable internal temperature of the globe.

Besides slags, dust, and lava, sometimes large quantities of water and mud accompany volcanic eruptions. During the eruption of Vesuvius in 1662 a torrent of water and mud poured down, overthrowing the houses and burying the inhabitants of villages. Near the foot of the mountain Roman cities were overwhelmed in the 1st century. In 1691 one of the volcanoes of Quito threw up mud and water so filled with dead fish as to cause a pestilence. Even more destructive outpourings have taken place in the volcanoes of Java, where wide tracts of luxuriant vegetation have at different times been buried under masses of dark gray mud sometimes 100 ft. thick. Mud volcanoes, perhaps not strictly volcanic, have periods of repose, when no discharge takes place, or the mud oozes tranquilly from the orifice, with shocks of activity, when large volumes of gas and sometimes columns of flame rush out with violence, throwing up mud and stones. The mud is usually cold. Among the products of such volcanoes are naphtha, inflammable gas, and sulphur. There are also many remarkable discharges of gases from the earth which seem to come from volcanic action. The most remarkable of these is in Java, known as the Valley of Death. There is a deep bosky hollow, in which from one small space on the bottom carbonic acid issues so copiously as to form the lower stratum of the atmosphere. Animals enticed by the seclusion and shelter of the spot pass in and are suffocated. This is the place that was long known as the val-

ley of the Bohon Upas, and the poison was supposed to come from a tree called by that name. Hot springs are another effect of volcanic action. They are widely distributed over the earth, but the most remarkable are in Iceland, and in Yellowstone Park, Wyoming. (See article NATIONAL PARKS.) These springs are usually intermittent in action, but explode at regular intervals, throwing up quantities of water and steam. The water usually contains silica in solution, which is deposited around the springs and forms their craters. In the Great geyser in Iceland the water is at boiling point (212°) at the surface, while a few yards below it is 266° Fahrenheit. See GEOLOGY; GEYSERS, and works referred to in the latter article. See illus., GEOLOGY, vol. VI.

VOLE, *Arvicola*, a genus of rodent quadrupeds, of a group which some naturalists constitute into a family (*arvicolidæ*), but which is more generally regarded as a tribe or sub-family of *muridæ* (q.v.). This group is characterized by a thicker and shorter form than that of the true rats and mice; an obtuse muzzle; ears of moderate size; a round and hairy tail, not so long as the body; the molar teeth with flat crowns, which present angular enameled plates. These characters exhibit an approach to the beaver family (*castoridæ*). The lemmings (q.v.) belong to this group. The species are numerous, and widely distributed, being found in Europe, Asia, Africa, and North and South America. Some of them are completely terrestrial in their habits, others are aquatic. Many are popularly called rats and mice, as the species of the genus *arvicola*, which are found in Britain. In this genus the teeth are only ten in number; two incisors and three molars in each jaw. One of the most common British species is the FIELD VOLE (*A. agrestis*), also known as the MEADOW MOUSE and SHORT-TAILED FIELD MOUSE. The whole length of the head and body is scarcely more than 4 in., that of the tail rather more than an inch and a quarter. The field vole has a large head, a very obtuse muzzle, ears just appearing above the fur, the thumb of the fore-feet rudimentary, and without a claw. The upper parts are reddish brown, the under parts ash-color, the feet and tail dusky. It burrows in the ground, or finds a retreat for itself in the excavations of some other animal, as of the mole. It chiefly inhabits low and damp situations, and dry seasons are very fatal to it. It produces from five to seven young at a birth. It is sometimes very injurious to plantations, by destroying the roots of trees and devouring their bark. Excessive numbers of this little animal were regarded in 1813 and 1814 as threatening the destruction of the forest of Dean, and the new forest in Hampshire; and many trees were killed; but a remedy was found in digging pits into which the voles fell, and from which they could not escape. The same method has been successfully employed in some of the forests of continental Europe. This species of vole is found in most parts of Europe, and in many parts of Asia. It is common in the Himalaya. — Another very common British species is the WATER VOLE (*A. amphibia*), popularly known as the WATER RAT, a much larger animal, the head and body being about 8½ in. in length, and the tail 4¾ inches. The head is thick and short, the muzzle very obtuse, the eyes small, the ears scarcely seen beyond the fur; the last joint only of the thumb of the fore-feet conspicuous beyond the skin. The fur is thick and shining, of a rich reddish brown mixed with gray above, yellowish gray beneath. Although the feet are not webbed the water vole swims extremely well, and not only at the surface of the water, but often under it. It burrows in the banks of streams, ditches, and ponds. Its food appears to consist chiefly of aquatic plants, although it objects to no kind of vegetable food, and has been known to store up potatoes in its burrow for winter. It has been supposed also to feed on worms, frogs, and small aquatic animals, and to be destructive to the spawn of fish; but this is very doubtful. This species is widely diffused over the continent of Europe. There is a black variety of it, common in some parts both of England and Scotland, which has been described as a distinct species (*A. atra*). Several species of vole are found in North America. See illus., RODENTIA, vol. XII.

VOLGA, the most important river of Russia, and the longest in Europe, has its origin in a marshy plain among the Valdai hills, in the government of Tver; lat. 57° 10′ n., long. 33° 10′ east. From its source, which is 550 ft. above ordinary sea-level, and 633 ft. above the level of the Caspian sea, into which it falls, the river flows s.e. to Zubzov, then n.e. past Tver and Koliazin to Mologa, where it turns e.s.e., and flows in that direction past Jaroslav, Kostroma, Nijni-Novgorod, and Kazan, 50 m. below which, on receiving the Kama, it turns s., passing Simbirsk, Stavropol, and Samara. Here its course again changes to s.w., and in this direction the river flows until it reaches Tzaritzin, when it bends to the s.e., and reaches the Caspian sea, which it enters by many mouths, and after a course of 2,320 miles. The Volga waters 9 governments—those of Tver, Jaroslav, Kostroma, Nijni-Novgorod, Kazan, Simbirsk, Saratov, Samara, and Astrakhan; but besides these, 12 other governments are watered by its tributaries. The course of the stream is generally divided into three parts—the upper part reaching from its source to its confluence with the Szeksna, and, though presenting many hindrances to navigation, yet capable of being traversed from Tver to Rybinsk by craft of 1½ and 2 ft. draught; the middle part, from Rybinsk in Jaroslav to Nijni-Novgorod, navigable for larger craft; and the lower Volga from Nijni-Novgorod to Astrakhan—where it is about 90 ft. deep—navigable for the largest vessels. Below Astrakhan the Volga is very much shallower —in some places only 1½ ft. deep. At Tver the breadth of the river is 720 ft.; at Mologa, 2,060 ft.; at Nijni-Novgorod, 2,069 ft., but sometimes in the spring 2½ m.

broad; at Simbirsk, about a mile broad; between Samara and Sysran, from 1 to 3 m. broad. Below Tzaritzin, at the confluence of the Sarpa, the river affords few facilities for navigation, and is remarkable for the number of branches into which it divides itself before it enters the Caspian sea. The banks of the Volga, which are elevated in the upper and middle reaches, become much lower as the river approaches its embouchure. The chief ferries and commercial towns on the Volga are: Rjev, Zubzov, Tver, Koliazin, Uglitch, Mologa, Rybinsk (the great center of the corn trade), Jaroslav, Kostroma, Nijni-Novgorod, Kazan, Simbirsk, Samara, Tzaritzin, and Astrakhan. The system of water-communication established by the Volga and its tributaries, is of the greatest importance to the commerce of Russia, connecting as it does the central districts of the country with the White sea by means of the canal of the prince of Würtemberg; with the Baltic by the three canal-systems of Tikhvinsk, Vishni-Volotchek, and Mariinsk; with the Black sea by the Upa canal, which connects with Oka and the Don; with the Caspian sea by the great stream of the Volga itself; and with Siberia by the rivers Kama and Tchussovaia. The principal affluents on the right are the Oka (q. v.) and the Sura; on the left, the Tvertza, Mologa, Szeksna, and Kama (q. v.).

VOLHY'NIA, a frontier government of west Russia, bounded on the s.w. by Galicia, and on the w. by Poland, from which it is separated by the river Bug. Area, 27,743 sq. m.; pop. '92, 2,462,069, composed of Russians, Poles, Lithuanians, Jews, Germans, and Tartars. The surface in the n. of the government is low, and plains and morasses, interspersed with forests, abound; in the s. there are hills, branches of the Carpathian mountains, but which do not rise higher than 1230 feet. Almost all the rivers flow n. and join the Pripet, an affluent of the Dnieper; a few streams, however, flow w. and join the Bug, by means of which river timber is floated down from this river to Prussia. The soil is sandy or clayey; agriculture flourishes in the s., and corn is exported to Odessa, Galicia, Poland, and partly to Great Russia. Cattle-breeding, formerly prosperous, has recently declined. Of the woods, which form the principal riches of the n. districts, fir is the chief. The mineral products include granite, lithographing stone, chalk, porcelain clay, and iron, and to some extent coal, graphite and amber. The forests abound in foxes, hares, and bears, and hunting is a favorite pastime. Many manufactories are in operation, including porcelain and machine-works, distilleries, sugar-refineries, and numerous different mills. Corn, wool, cloth, linen, timber, honey, and wax are the principal articles of trade.

VOLITION. See WILL.

VOLKSLIED. See LIED.

VOLLEY, the simultaneous discharge of a number of small arms. The same operation from cannon is called a salvo.

VOLNEY, CONSTANTIN FRANÇOIS CHASSEBŒUF, Comte de, was b. at Craon, in Anjou, on Feb. 3, 1757. He was the son of an advocate of good reputation. His family name was Chassebœuf, but on arriving at manhood he assumed the additional surname of Volney. He got his preliminary education at the colleges of Ancenis and Angers, and afterward went through a protracted course of study at the university of Paris. His father wishing him to join his own profession, he spent some time in preparing for the bar; but he renounced law for medicine, which, however, he never practiced. He had inherited a competency from his mother, and soon after completing his studies, in the year 1783, he set out for Egypt, with the intention of traveling in Egypt and Syria. This expedition occupied him about 4 years. On his return to France in 1787 he published his celebrated *Travels in Syria and Egypt*, which still contain the most trustworthy as well as one of the liveliest and most interesting accounts which have been published of the tribes with which he came in contact. This work at once procured him a great reputation. At first there was a disposition to question the veracity of some of his descriptions, but their truthfulness was fully confirmed when the French became more familiar with the Egyptians and the Arabs through the expeditition of 1796. The sagacity of the chief political conclusions to which his residence among these peoples had brought him, which in 1788 he embodied in a pamphlet—*Considerations on the War between the Turks and the Russians*—has also been shown by subsequent events. In 1790 he was elected to the etats généraux as a member for his native district, and took a somewhat prominent part in the political discussions of the years which followed, showing himself as he has done in his works a fast friend of the public liberties, a mocker at all systems of religion, and at the same time a fearless opponent of popular excesses. He was imprisoned for his outspokenness in 1793, and was not liberated till after the downfall of Robespierre in July of the following year.

In Sept., 1794, Volney published his *Ruins; Reflections upon the Revolutions of Empires*, upon which and upon his *Travels* his reputation chiefly rests. Volney believed that political, like all other organizations, are subject to decay and destruction. The discussions contained in the *Ruins* cover almost all the radical questions in politics. Its principles are those of 1789. It vindicates the doctrine of the rights of man, establishes the duty of toleration in matters of opinion, and maintains, with perhaps too much of

sarcasm and mockery, the human origin and the essential falsity of all religious systems. In the previous year Volney had published his *Natural Law*, a catechism for a French "citizen," in which he treats morality as a physical and material science, to be studied upon the same methods as the other natural sciences, and having no object but the conservation and improvement of society. This work was afterward republished under the title of the *Physical Principles of Morality*.

Toward the close of 1794 he was appointed professor of history in the short-lived ecole normale; and the brilliant discourses, not untinged with paradox, which he delivered in this capacity made a sensation in Paris even at that unsettled time. On the suppression of the ecole normale in 1795 he went to the United States, intending to spend the remainder of his days there; but circumstances made his residence there extremly disagreeable to him, and he returned to France in the spring of 1798. In his absence he had been elected a member of the institute; he was soon after his return admitted to the academy; and henceforth his life, though not inactive, was prosperous and untroubled. He had early been acquainted with Bonaparte, and had been of service to him at the time when political circumstances had deprived him of employment; and Bonaparte, on becoming first consul, desired to associate him with himself in the government as consul or as minister of the interior. Volney refused both offices, but accepted a seat in the senate. He protested against the establishment of the empire and resigned his seat in the senate; but his resignation was declined, and during the existence of the empire he formed one of the little band, sneered at by Napoleon as *idéologues*, who in the senate attempted by their criticisms to restrain the arbitrary conduct of the emperor. Henceforth, however, his occupations were mostly literary. He published *Researches into Ancient History*, several of the papers contained in which were written in the earlier part of his career; and also several linguistic works, in which he attempted to popularize, and, by means of a universal alphabet, to simplify the study of the eastern languages. He had accepted from Napoleon the title of count and the commandership of the legion of honor, and upon Napoleon's downfall he was among those who were called to the house of peers by Louis XVIII. His latest work, published in 1819, was *The History of Samuel, the Inventor of the Sacredness of Kings*. Volney died April 25, 1820, shortly after completing his 63d year.

VOLOGDA, an extensive government of Great Russia, bounded on the e. by the Ural mountains, and on the n.w. by the government of Archangel. Area, 155,498 sq. m.; pop. '92, 1,362,002, chiefly Russians, but comprising also a few Finns, by which race this territory was inhabited in early times. The districts in the e. adjoining the Ural mountains, are traversed by branches of that chain, which rise to the height of from 3000 to 4000 feet. But by far the greater part of the government is occupied by marshy plains, covered with impenetrable forests. The soil is not fertile, except in the s. districts, which are the most densely peopled, and produce corn sufficient for local consumption and the supply of the distilleries. In the middle districts, there are comparatively few inhabitants; cultivated land is rarely seen, and hemp is the only crop produced liberally. The wooded morasses of the n. are inhabited only by Finnish tribes, engaged in hunting. The majority of the people are nomadic in their habits. The banks of the rivers are, as a rule, the only inhabited places. The principal rivers are the Northern Dwina, with its great upper waters, the Suchona, Jug, and Witchegda; and the Petchora, with its affluents. Lakes are numerous. Salt-works, iron-works, and distilleries are in operation; and salt, iron, skins, tallow-candles, and cheese are exported; and corn and manufactured goods imported.

VOLOGDA, a city of Great Russia, in the s.w. angle of the government of the same name, of which it is capital, stands on both banks of the river Vologda, 260 m. (by rail) n.e. of Moscow. It is said to have been founded in the 13th c. by settlers from Novgorod, to which principality it belonged down to the 15th c., when it was annexed to Moscow. In 1553, when England opened up a trade with Russia, through the port of Archangel, Vologda was the great entrepôt for goods deported n. by the Northern Dwina; and even yet it exports to St. Petersburg and Archangel various products of its own and neighboring governments, to a considerable amount. Timber, tallow, potash, soap, candles, leather, cordage and fur are exported. Political offenders are sometimes banished to Vologda. Pop. '91, 17,825.

VOLSCI, an ancient Italian people, closely related to the Umbrians. See UMBRIA. Their territory was bounded on the w. by that of the Latini, on the n. they marched with the Æqui and Hernici, on the e. with the Samnites, and on the s. they had the sea. Along nearly the whole of their coast lay the Pontine marshes, while inland, their territory was somewhat mountainous. The Volsci were a brave and warlike people, who, frequently in alliance with the Æqui, were incessantly at war with the Romans for upward of 200 years previous to 338 B.C., about which time they appear to have been finally subdued, their territory incorporated into Latium, and they themselves created Roman citizens. See LATINI. These wars were very harassing to the Romans, as they were often carried on not so much by the Volsci as a whole, as by different cities, each frequently on its own account. Some of the chief towns, and those which took a principal part in the wars, were Antium, Velitræ, Satricum, Privernum, Ulubræ, Suessa, Pometia, Anxur, and Tarracina, and later Forum Appii and Tres Tabernæ. The legend of

Coriolanus (q.v.) is connected with the Volscian wars. See Rome, Tarquinius Superbus, Antium. From the time of their final subjugation, their history belongs to that of Rome (q.v.).

VOLSK, or Volgsk, a t. of European Russia, in the government of Saratov, on the right bank of the Volga, 80 m. n.e. of Saratov. Fat and skins are prepared and exported to St. Petersburg, and corn is exported in large quantities to Astrakhan and Rybinsk. The inhabitants are chiefly engaged in agriculture. Pop. 1889, 38,550.

VOLT. See Volta: Electricity.

VOLTA, Alessandro, a celebrated Italian physicist, was born at Como, of a noble family, in 1745, and received an excellent education. In 1774, he was appointed professor of natural philosophy at Pavia, and continued to discharge the duties of this chair till 1804, when he retired to his native town, to spend the rest of his days. Volta, while but a youth, had exhibited considerable taste for letters, and had even written two poems, one in Italian, and the other in Latin; but as he grew older, he abandoned all such pursuits, and devoted himself exclusively to the sciences, especially those connected with electricity. At intervals between 1777 and 1782, he visited Switzerland, Tuscany, Germany, Holland, France, and England, making the acquaintance of the most eminent philosophers of these countries; and on his return is said to have introduced the culture of the potato into Lombardy. In 1796, he was one of a deputation sent to solicit the forbearance of Napoleon; and was received with distinction by the French general, who afterward invited him to Paris, to exhibit, to the members of the Institute, the action of the "pile" (see Galvanism), which he had invented, enrolled him in the legion of honor, and conferred on him the order of the iron crown, with the titles of count and senator of the kingdom of Italy. He was also elected (1801) a foreign associate of the French institute, ten years after he had been made a fellow of the royal society of London. He died at Como, Mar. 5, 1827. Volta's contributions to the science of electricity are of great importance, the chief of them being his theory, in opposition to the "animal-electricity" doctrine of Galvani, that the electric power resides in the metals; although, in turn, he fell into the error of supposing that the chemical action of the different kinds of metal on each other was only incidental. He also invented an electric battery, consisting of a series of cups arranged in a circle, each cup containing a saline solution in which were immersed, edgewise, two plates, one of zinc and the other of silver, the zinc plate in one cup being connected with the silver one in the next by means of a wire. This battery was, however, soon after superseded by his "pile." He also invented, in 1775, the *Electrophorus* (q.v.); in 1782, the electrical *Condenser* (q.v.), employing with it an electrometer (see Electricity), in which two straws were employed instead of the gold-leaf strips now in use; and also (1777) the hydrogen-lamp, and the electrical pistol. Most of his important discoveries were communicated by him directly to the royal society (published in the *Philosophical Transactions* of 1782,1783,1800). A collection of V.'s works, in five vols., was published, in 1816, at Florence. After him Galvanism (q.v.) is often called *Voltaic Electricity;* and the practical unit of electro-magnetic force is called a *volt.*

VOLTAIRE (François Marie Arouet, his true name)—one of the most famous of French writers—was b. according to his own accounts, as given in later life, on Feb. 20, 1694, at Chatenay, near Sceaux. The register of his baptism, however, assigns Paris as the place of his birth, and dates it Nov. 21 of that year. As to which of these statements may be really the correct one, his biographers are not yet fully agreed. His father was François Arouet, a notary of the Châtelet, ultimately treasurer of the chamber of accounts; his mother, Marguerite D'Aumar, of a noble family of Poitou. Of two sons born to them, François was the younger. He received his education at the college of Louis le Grand in Paris; and on completion, he was set to study law by his father. But he found this pursuit too disgusting, and speedily quitted it for the career of a man of letters. By his godfather, the abbé de Châteauneuf, who was very intimate with her, he was introduced to the celebrated Ninon de l'Enclos, and through her to the best French society of the period. In these wicked and witty circles, being himself deficient in neither wickedness nor wit, the young man prospered extremely: and so perfectly unexceptionable was the company in which he found himself, that one day he could exclaim, looking round the table with complacency: "Are we all, then, either princes or poets?" His father, however, deeply disapproving of the life he led as immoral, and probably not inexpensive, had him sent to Holland with an embassy. Here he became involved in a love-affair of the more respectable kind, which ended, not in marriage, as he seems to have proposed, but in his being sent back to Paris, to resume his gay career. Shortly, it suffered another interruption: on suspicion (unfounded) of his being the author of some satirical verses, reflecting on the government of Louis XIV., then just dead, he was sent to the Bastille (May 17, 1717), where he remained upward of a year. This time of imprisonment he improved by sketching his famous poem, afterward published as the *Henriade*, and by finishing his tragedy, *Œdipe*, which was produced on Nov. 18, 1718, and had so great a success with the public, as not only to delight the author, but somewhat to mollify his old parent, who began to surmise

that the despised "poetry" of his offspring was not unlikely to come to something. The same success did not, however, attend his next ventures: his tragedy, *Artemire*, produced in 1720, was hissed off the stage; and his *Mariane*, which followed in 1724, fared but little better. Meantime he had again visited Holland, making, on the way, the acquaintance of Jean Baptiste Rousseau, a poet of some importance, then living at Brussels. The two geniuses met as friends, only to part as irreconcilable enemies. Their quarrel is said to have originated in a characteristic *mot* of Voltaire, who, his critical opinion being asked of an *Ode à la Postérité*, which Rousseau read to him, had the candor to reply thus: "Mon ami, voilà une lettre qui n'arrivera jamais à son adresse." In the summer of 1725 occurred a misadventure, which, for Voltaire, had important consequences. At the dinner-table of the duke de Sulli, he resented with spirit an affront put upon him by the chevalier de Rohan, who, worsted in the war of wit, as most men were likely to find themselves with Voltaire, avenged himself some days after by having his adversary thrashed in public by footmen. Subjected to so gross an outrage, Voltaire retired for a time into private life, assiduously perfected himself in the small-sword exercise, and then courteously entreated the chevalier to a meeting in the *duello*. The chevalier, as it proved, had small stomach for the encounter; having immortalized himself sufficiently by his insult to the poet, he considered it unnecessary to aspire to the further immortality of being killed by him. Under superficial pretenses of accepting the challenge, his practical answer to it came in the form of a *lettre de cachet*, which consigned Voltaire once more to the Bastille. His imprisonment was not on this occasion a long one; but it was only under sentence of exile that he was permitted to issue from durance; and on doing so, he betook himself to England. Some little time previous, the young Arouet had assumed the name of Voltaire, destined to become so famous. As to the origin of this name, considerable perplexity has existed; but there can scarce be a doubt of the correctness of the conjecture thrown out by Mr. Carlyle, in the second volume of his *Frederick*, that it is simply an anagram of Arouet l.j. (*le jeune*).

Arriving in England in 1726, Voltaire remained there upward of two years. Of this episode of his life, we have only the most meager account. It is certain, in a general way, that he had the *entrée* to the best English society; he knew Bolingbroke, Pope, and we need not doubt, many others of the intellectually distinguished. Of his visit to the famous Mr. Congreve, and the little skirmish of wit between them, we have express record. It was a whim of Congreve to affect dislike of his fame as an author, as to a certain extent a disparagement of his claims as a person of quality. On his signifying to Voltaire that it was simply as this last he desired that his friends should regard him, he was answered to the effect, that had he been nothing more than the elegant gentleman he considered himself, M. de Voltaire would scarce have thought it worth while to solicit the honor of his acquaintance. To Voltaire, his residence in England was fruitful of new knowledge and ideas; in the school of the English deists, Bolingbroke, Collins, Tindal, Wollaston, etc., he found speculations much to his mind; the philosophies of Newton and Locke he studied diligently; and in his subsequent dramas there may be traced a distinct influence from Shakespeare, whom, however, he has expressly vilified as a barbarous monster of a writer, intolerable to any reader with the least tincture of orthodox French *goût* in him. Not the less the distinction remains with Voltaire of having been the first Frenchman to recognize in some decisive, if grudging and inadequate way, the essential superiority of our great national poet. The intellectual debt thus indicated was not the only one which Voltaire owed to England. While resident there, he published in a revised form his epic poem, the *Henriade*, a surreptitious edition of which had already appeared in France. The work was dedicated in English to queen Caroline; the subscription for it was headed by her and other members of the royal family; the rank and fashion of the country could not but follow the illustrious example set them; and for result Voltaire could convey into his pocket the comfortable sum (stated so high as $40,000), which became the basis of his future fortune. From the time of his return to Paris in 1728, he had always on hand some speculation: investments in corn, bacon, or whatever a pretty penny could be turned by, with now and then a fat army-contract, which a friend might have interest to secure for him; and so shrewd in his finance was he, that, owing but little to his books, which, despite of their immense popularity, were never a source of great profit to him, his income at his death is ascertained to have netted some $35,000 per annum, a revenue then to be styled princely. Of his literary labors, from this time forward unremitting, the sum of which remains in something like ninety volumes, no detailed account can here be attempted. His was truly a universal genius; he wrote literally everything—histories, dramas, poems, disquisitions, literary, philosophical, and scientific; novels, for the most part with some doctrinal purpose, of which his famous *Candide, or the Optimist*, may stand as the type; his literary correspondence was on an unexampled scale; and he was seldom without some fierce polemic on hand, in which his adversaries had to writhe for the amusement of the public, under the scourge of his envenomed wit.

In the gay society of Paris, he became acquainted with a certain Mme. du Châtelet, who was living apart from her husband, the marquis, though still on polite terms with him. She was *assez spirituelle;* a most fascinating woman of the world, and in the mat-

ter of intellectual accomplishment, the bluest wonder of the period; most especially she was deep in mathematics, and had mastered the mysteries of Newton's *Principia*. As himself an admirer of Newton, Voltaire could not but be charmed to meet him thus surprisingly put into petticoats; nor could a woman so intellectual as madame fail, in her turn, to appreciate the tender attentions of such a genius as M. de Voltaire. Their intimacy became extreme; and finally, in 1733—the husband of the lady behaving like a philosopher and man of fashion of the time, and continuing now and then to visit them—they went off to prosecute it undisturbed at Cirey, an old château in Champagne, the property of M. du Châtelet Here, for the most part, they diligently studied Newton together for the next fifteen years. The arrangement seems to have been on the whole a not unhappy one; but toward the close it became complicated for M. de Voltaire by the advent of another lover, in the person of a Monsieur de Saint-Lambert. It is not conjectured that this gentleman knew anything of Newton, or was at all such a genius as Voltaire; but it is certain that, on some other ground unexplained, he found favor with Mme. du Châtelet. The philosophy which the husband had been good enough to practice in favor of Voltaire was now required of himself; and after a little unpleasantness he was able to reconcile himself to the inevitable. This curious triangular love-affair—or *square*, if we include the husband—was not, however, of very long duration. In 1748 Mme. du Châtelet died in child-bed. Voltaire was overcome with grief; and the touching reproach which, in the first agony of bereavement, he addressed to the culpable M. de Saint-Lambert, a fortunate chance has preserved for us: "*Eh! mon Dieu! Monsieur, de quoi vous avisiez vous de lui faire un enfant.*" This, which is now so shocking, illustrates strikingly the morals of a period in which it seemed entirely *comme il faut*.

To dissipate the sense of loneliness which overpowered him in the loss of his "divine Emilie," as he was wont, in his more lyrical moments, to call her, Voltaire once more betook himself to Paris, whence, in 1750, he proceeded to Berlin, on the invitation of the young king of Prussia, Frederick, since known as "the great." Between him and Voltaire much correspondence had already passed; and they seem to have entertained for each other a sincere admiration and regard. When they came together, however, it was found, as so often in such cases before and since, that it is not in the matter of mountains only that "distance lends enchantment to the view." They quarreled bitterly, and parted; Voltaire, at his exit from the country, being subjected to indignities which he found it hard to forgive. Into the details of the quarrel we need not enter. When we say that the king was a poet at once most profuse and most execrable; and that the main function of Voltaire—himself a poet—was to criticise and correct his verses, it should almost seem that we indicate, without going further, a sufficient *origo mali*. Voltaire detested the king's verses; the king could hardly have been even the very bad poet he was, without heartily detesting Voltaire's criticism and corrections. Is it marvelous that in no long time they got heartily to detest each other? A reconciliation was afterward effected, and their literary correspondence was resumed under the old forms of friendliness; but meantime Voltaire had avenged himself in the amusing but most scandalous chronicle, entitled *Vie Privée du Roi de Prusse*, which was found at his death among his papers, and published, as there is pretty good reason to suppose the wicked wit meant it should be.

After some years of a somewhat unsettled kind, Voltaire, in 1758, established himself along with his niece, Mme. Denis, at Ferney in Switzerland, where, with little exception, the last 20 years of his life were passed. During this period some generous traits of character are recorded of him. Thus, he rescued from extreme want a grandniece of Corneille the great dramatist, had her carefully educated under his own eye at Ferney, and made over to her the proceeds of an annotated edition of her ancestor's works, which he issued for her express benefit. His noble exertions in behalf of the Calas family, the victims of a shameful persecution, are also well known. In 1778 he was induced by his niece to revisit Paris. By the Parisians the poet, now in his 84th year, was received with a perfect tumult of enthusiasm, the excitement connected with which is thought to have hastened his death, which took place on May 30 of that year.

With the doubtful exception of Rousseau (Jean Jacques), who in his character of *vates* and enthusiast, was perhaps even more deeply influential, Voltaire is by far the most memorable of the band of celebrated writers whose crusade against established opinions was preparing the grand *culbute* of the French revolution. As every one knows, it was mainly in the field of religious polemic that his destructive energies were exerted. It is common to stigmatize him as an atheist, but this is simply to exhibit ignorance. Discarding revelation, he steadily upheld the truths of natural religion, and was, in fact, a deist pretty much of the English type. As such, he was not a little despised by the more "advanced" minds of the period, Diderot and the like, who considered belief in a God clear evidence of intellectual infirmity. His favorite weapon was ridicule, and there was never, perhaps, a greater master of it. In a particular form of polished mockery, Voltaire remains almost without a rival. His prose is the perfection of French style; it is admirable in grace, clearness, vivacity, and alive like a sparkling wine with the particular quality of *esprit* peculiar to the people and the language. As a dramatist Voltaire takes rank as a worthy third with his two great prede-

cessors, Corneille and Racine. His most famous poems are the *Henriade*, before mentioned, the one epic of the language, and *La Pucelle*, which is, perhaps, more properly to be styled infamous, such is the profanity and indecency with which the writer has willfully defiled the heroic story of the maid of Orleans. In the historical works of Voltaire, with the utmost lucidity of method, there are traces of a more philosophical treatment than had previously been applied to such subjects. For its narrative charm, his little historiette, *Charles Douze*, familiar to every school-boy, is in its kind a perfect model. In English, biographical works on Voltaire are very few in number. Of his earlier life, a most racy and amusing sketch will be found in the second volume of Mr. Carlyle's *Frederick the Great;* and his relations with Frederick are of course in that work treated of in full, with the writer's characteristic humor and insight. As a critical estimate at once of the man and of the writer, nothing better can anywhere be found than Mr. Carlyle's earlier essay.

In 1866 the first volume of a *Life and Times of François-Marie Arouet, calling himself Voltaire*, by Francis Espinasse, was published by Chapman and Hall; but this work, which promised to ably supply a desideratum, has been left unfinished. See also *Voltaire*, by David Friedrich Strauss (1870); *Voltaire*, by John Morley (London, 1872); and *Voltaire et la Société du XVIII^e Siècle*, by T. G. Desnoiresterres (8 vols. 1855–76). The *Life* by Parton (1881) contains a mass of facts, but is poor in criticism.

VOLTERRA, a t. of central Italy, in the province of Pisa, stands on a table-land at the height of about 1800 ft. above sea-level, 30 m. s.e. of Leghorn. It is surrounded by cyclopean walls, which are in a better state of preservation than any structures of the same kind in Italy. The gate called *l' Arco*, and the remains of baths and of an amphitheater, are interesting vestiges of antiquity; the cathedral, the *Museo Nazionale* in the *Palazzo Tagaia* has fine collections. Volterra contains a college, numerous schools, and a library of 120,000 volumes. Wine, oil, corn, and mulberry-trees are grown in the lands belonging to the town, which also possesses considerable mineral wealth. The salt works supply all Tuscany with salt. Pop. '81, 5347.

Volterra, the ancient *Volaterræ*, was one of the most powerful and important of all the Etruscan cities, and came into the possession of Rome 474 B.C.; after the fall of the empire, it suffered much from the invasion of barbarians.

VOLTERRA, Daniele da, 1509–66, b. Tuscany, studied art in Volterra, Siena, and Rome. In the frescoing of the Vatican he assisted Del Vaga, his former teacher, was an associate of Michael Angelo and was nick-named the "breeches maker" for having clothed some of the latter's nude figures in the "Last Judgment" by order of Paul IV. His best works were the "Descent from the Cross," in the church of Trinita de'Monti, and the "Massacre of the Innocents," in Florence.

VOLTIGEURS, picked companies of irregular riflemen in the French regiments. They are selected for courage, great activity, and small stature. It is their privilege to lead the attack.

VOLTI SUBITO (Ital. turn quickly), in music, an indication placed at the foot of a page, to signify that the page ought to be turned without delay.

VOLTRI, a t. of northern Italy, in the province of Genoa, and 9 m. w. of the city of that name, on the gulf of Genoa. Its churches are richly adorned; it contains many fine villas, and manufactures paper extensively. Near it are the sulphureous springs and baths of Aqua Santa, very efficacious in cases of cutaneous disease. Pop. 6,000.

VOLTUMNA, the goddess of the Etruscan confederation. The deputies from the 12 divisions met at her temple, whose site is uncertain, and is placed by some at Monte Fiascone, and by others at Viterbo.

VOLTURNO, a river in s. Italy, rising in Monte Santa Croce, flowing s.e., and w., and emptying after a course of about 100 m. into the gulf of Gaëta. It is the ancient Vulturnus. Garibaldi fought the Neapolitan royal army on its banks in the autumn of 1866.

VOLUMET'RIC ANALYSIS, in chemistry, consists in submitting the substance to be estimated to certain characteristic reactions, the chemist employing for such reactions liquids of known strength, and from the quantity of liquid employed to induce the reaction, determining the weight of the substance to be estimated by means of the laws of equivalence. The idea of this method first suggested itself to Gay-Lussac in considering how most readily to determine the amount of silver in an alloy of that metal and copper; but the method itself did not come into general use till within the last 30 years. The liquid reagents of known strength are called *standard solutions;* and the amount employed may be estimated either by weight or by volume, but the latter, being the easiest of application, is universally employed; and hence this method of analysis, based on the use of standard solutions, is called *volumetric analysis.* In order that a reaction may be applicable in volumetric analysis it must satisfy the two following conditions: (1) It must not occupy much time; and (2) the termination of the reaction must be

easily recognized and unmistakable to the eye. The necessity that these conditions should be fulfilled, very much limits the the number of volumetric processes. In addition to the ordinary chemical apparatus, this kind of analysis requires graduated glass vessels of different kinds for the measurement of the standard solutions. Of these, the most essential are: (1) *Pipettes*, which are glass vessels of the form of figs. 1 and 2, intended for the delivery of the standard solution. Fig. 1 is provided with a single mark upon the neck, while fig. 2 is divided and graduated through its whole length, the division being always made into cubic centimeters (c. c.), according to French scale; (2) *Flasks* graduated for the contents in various sizes from one-tenth of a liter to five liters, and used for the preparation of standard solutions; (3) *Burettes*, or graduated tubes for measuring the liquids used in an analysis. The burette was invented by Gay-Lussac; but since his time, various modifications have been proposed, the best of which, for general purposes, is that which is known as Mohr's burette. It is shown in fig. 3; and to its lower part is attached an india-rubber tube and spring-clamp or clip (*quetsch-hahn*). Its principal advantages over other forms of the instrument are, that its constant upright position enables the operator at once to read off the number of degrees of standard (or test) solution used for any analysis, while the quantity of fluid to be delivered can be most accurately regulated by the pressure of the thumb and finger on the clamp; moreover, as it is not held in the hand, no error is likely to arise in the measurement from the heat of the operator's hand. The greatest drawback to it is that it cannot be used for those test solutions which decompose india-rubber.

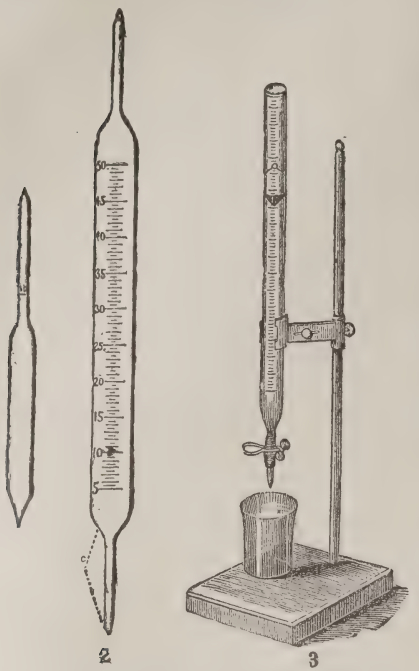


FIG. 1.—A pipette, containing 10 c. c.
FIG. 2.—A pipette, containing 50 c. c., divided through its whole length in c. c.; being thus graduated for measuring the delivery of fluids.
FIG. 3.—*a*, the india-rubber; *b*, the slips made of brass wire, by which the india-rubber tube can be closed at will.

The *standard solutions*, known also as *test* or *titrated solutions* (from the French word *titre*, which signifies the standard of a coin), may be divided into (1) such as are immediately prepared by weighing a substance of known composition, dissolving it, and diluting it to the required volume; and (2) such as are prepared by approximate mixture and subsequent exact analysis. The preparation of the first kind requires no description; for the preparation of the second kind, we must refer to the article ANALYSIS, VOLUMETRIC," in Watts's *Dictionary of Chemistry*, vol. 1. p. 259, where the method is fully explained, and as an example, the preparation of a standard solution of sulphuric acid containing *t* grammes of hydrated sulphuric acid in 1 liter is given. It is obviously essential that the greatest care must be taken both with respect to the graduation of the measuring instruments and the strength and purity of the standard solutions, which must be protected from evaporation and other hurtful influences by being kept in bottles of 1 or 2 liters' capacity, provided with well-ground stoppers.

Volumetric methods are usually classified as follows, according to the principles on which they are based—(1) *Analysis by saturation*, when the quantity of a base or an acid is measured by the quantity of acid or base which is required for exact saturation—a point to be determined by test-papers, tincture of litmus, etc. (2) *Analysis by oxidation and reduction*, when the quantity of the substance to be determined is found by the quantity of chlorine, bromine, iodine, or oxygen to which it is equivalent (regarded as oxidant), or by the quantity of chlorine, bromine, iodine, or oxygen which it requires to pass from a lower to a higher stage of oxidation. The chief oxidizing agents are permanganate of potash and bichromate of potash; while the reducing agents chiefly used are protoxide of iron and hyposulphite of soda. (3) *Analysis by precipitation*, when the determination of a substance is effected by precipitating it in some insoluble and definite combination. Our limited space does not admit of our giving an example of more than one of these forms of analysis, and from its historic interest we shall select the last, in its application to the determination of silver. We shall borrow Mr. Sutton's account of this process. "Suppose," he observes, "that it is desirable to know the quantity of pure silver contained in a shilling. The coin is first dissolved in nitric acid, by which means a bluish solution containing silver, copper, and probably other metals, is obtained. It is a known fact that chlorine combines with silver in the presence of other metals to

form chloride of silver, which is insoluble in nitric acid. The proportions in which the combination takes place are 35.5 of chlorine to every 108 of silver; consequently, if a standard solution of pure chloride of sodium is prepared by dissolving 58.5 grains of the salt—i.e., 1 eq. sodium (= 23) *plus* 1 eq. chlorine (= 35.5) or 1 eq. chloride of sodium—in so much distilled water as will exactly make up 1000 grains by measure, every single grain of this solution will combine with 0.1080 of a grain of pure silver to form chloride of silver, which precipitates to the bottom of the vessel in which the mixture is made. In the process of adding the salt solution to the silver, drop by drop, a point is at last reached when the precipitate ceases to form. Here the process must stop. On looking carefully at the graduated vessel from which the standard solution has been used, the operator sees at once the number of grains that have been necessary to produce the complete decomposition. For example, suppose the quantity used was 520 grains; all that is necessary to be done is to multiply 0.1080 grains by 520, which shows the amount of pure silver present to be 56.16 grains." By volumetric as compared with ordinary analysis, a large amount of time, labor, and therefore of expense, is saved; at the loss, however, often of due accuracy, unless the greatest care be taken that the standard solutions are of due strength, and the instruments accurately graduated. An analysis can thus be completed in a quarter of an hour that would formerly have occupied a day or more. Independently of its application to pure chemistry, it facilitates to a great extent the chemical analysis of urine (on which subject see the English translation of Neubauer and Vogel *On the Urine*, published by the New Syd. Soc.), of waters (on which see Parkes *On Hygiene*), of manures, soils, etc.; and its processes have been freely introduced in the British Pharmacopœia. The standard book on this subject is that of Mohr, a German chemist; the English reader may consult the text-books of Scott of Dublin, and Sutton of Norwich, and various memoirs in the *Chemical News*.

VOLUNTARY CONVEYANCE is, in bankruptcy and other proceedings, a conveyance which is made without any legal consideration, either of money or of marriage; and in competition with creditors having deeds made for consideration, is often deemed fraudulent, and is generally postponed or set aside altogether.

By an early statute (27 Eliz.) there is a presumption of fraud in cases of voluntary conveyance, but this may be repelled by evidence that there was reciprocity of benefits, and that the transaction was *bona fide* and not intended to deceive a subsequent purchaser. The statute alluded to, from its date, forms part of the common law of the United States, and has not been materially altered by state laws. It is held that such a conveyance is good as between the parties to it; and a distinction is made between prior and subsequent creditors, the former deriving no benefit from the statute. As to goods and chattels, the law was established by 3 Henry VII. and 13 Eliz. c. 5, which declare such conveyances, if made with intent to delay, hinder, and defraud creditors, void as against the person to whom such frauds would be prejudicial.

VOLUNTARYISM, the principles or system of polity distinctive of those who advocate the separation of church and state; the cessation of state endowments and state grants for religious purposes, and, in general, of all interference, patronage, or exercise of authority on the part of the civil power in the religious and ecclesiastical affairs of the subject. The terms Voluntaryism and Voluntary have been in use since the date of the keen discussions regarding civil establishments of religion—commonly called the "Voluntary controversy"—which sprung up in the second decade of this century between churchmen and dissenters, in Scotland; and they serve to suggest, not inappositely, the fundamental conception which underlies the creed of religious dissent, that all true worship, or acceptable service in religion, must be the free expression of individual minds, and that, therefore, religion ought to be left by civil society to mold itself spontaneously according to its own institutions and spiritual nature, without violence to individual freedom from any interposition of secular authority or compulsory influence. Voluntaryism seeks to define more accurately the limits of civil power by defining more adequately than preceding theories had done the latitude due to the movements of religion. Assigning the magistrate his proper sphere, it is equally careful to assign the church and the individual their appropriate spheres of responsibility and duty in reference to religion, within which they may work unchecked, in full harmony with all the claims of civil order. Voluntaryism may be regarded as the formula of advanced Protestantism, the corrected doctrine of church and state, which the failure of the experiment of national churches has forced on public thought. It is a protest in modern language against the encroachment of the temporal power, whether under the name of magistrate, nation, or political majority, on the rights and liberties of individual conscience. Voluntaryism has sometimes been erroneously considered the offspring of theological neutrality. On the contrary, its leading advocates base it on the expressed law of Christ respecting the constitution, administration, support, and extension of the church, as well as on the rights of conscience, the nature of civil government, and considerations of general equity and policy. In its most extensive sense, Voluntaryism embraces the whole question of the province of the magistrate in reference to religion and the church. Voluntaries admit that magistrates as well as other men, being under law to God, ought

so to execute the proper duties of their office that all shall be done in consistency with the paramount claims of morality and religion. At the same time, the nature and design of civil government excludes their authority from the domain of religion and conscience, and confines it to the secular concerns of individuals and of society. Magistrates, like other men, are under obligation to seek and to follow the highest available light and guidance in duty; but it is not therefore allowed them to convert the rules of the Divine Word, which are addressed exclusively to the individual conscience, into laws for civil society. God alone being lord of the conscience, such laws only—though revealed in his Word—may be adopted and enforced in civil society as are requisite for its outward preservation, peace, and good order, and for the advancement of those secular interests which are the proper care of its rulers. While, therefore, magistrates, no less than other men—and for reasons common to all favored with the Gospel ought, as individuals, to embrace and profess the Christian religion, and to employ wisely and justly the influence arising from their circumstances and station, it is no part of their political or official duty, or of the homage required of them by Christ, to emit, adopt, prescribe, or enforce a confession of faith; neither is it within their province to aim at establishing or propagating Christianity by the civil arm, to provide for, endow, or subsidize its teachers either in churches or schools; but it is their duty impartially to protect all their subjects, of whatever creed, in the enjoyment of full religious liberty, so long as their manner of exercising this civil right does not infringe on the equal rights of others. On this ground, and with such qualification, it is their duty to abstain from all interference with the jurisdiction and economy of the church—not excepting the matter of its support—which being regulated, as Voluntaries believe, by special ordinances of Jesus Christ, its head, it is an invasion of his prerogatives, and a frustration of his law for its support and extension, to place, or suffer to be placed, on the footing of a civil establishment. The doctrine regarding the support of religion has always been an important article in the Voluntary creed, and, in a restricted sense, Voluntaryism has been popularly defined by this doctrine. Negatively, the duty of providing for the support of Christian institutions does not lie with the magistrate or nation. The giving of property for the support of the gospel has been elevated by Voluntaryism from the position of an almost eleemosynary and political custom, to the rank of a systematic obligation and a financial law of the church. It is recognized as an act of religion, the duty and privilege of all Christians; and as each man is a steward of his silver or gold, responsible to none but its great owner for his disposal of it in religious matters, the magistrate can possess no right to demand from him any portion for religious uses, or to apply to these uses the proceeds of taxation imposed for general ends. Civil society being promiscuous and variable in its constituents, a fixed arrangement for the endowment of religious bodies out of the public funds is a fixed usurpation—as a system of occasional grants is an occasional usurpation—upon the liberty and property of all who dissent. The existence of an absolute unanimity among the subjects—even were it possible, as it would be otherwise, to ascertain and secure it from time to time—however it might remove for the moment from any minds the feeling of political grievance incident to such arrangements, could neither justify them as a policy, nor alter their character as an interference with religion in its economics. In its broad aspect, as an overstepping of the sphere of magistracy, all who restrict the magistrate, on whatever specific grounds, to secular affairs, must deem such interference objectionable; and Christian Voluntaries would reasonably ask, why legal machinery should be employed to gather the offerings which, in the state of public sentiment supposed, must be flowing unforced through their natural channnls? and in particular, whether, if Christ has not appointed the magistrate to "tithe and toll" for his church, society can presume to assign him a work beyond his province? There is a manifest division of duties dictated alike by reason and revelation; and Voluntaryism claims the results of experience as proof of the entire want of adaptation in the compulsory or magistratical power to deal with the support of a living religion. To burden the rent-roll, increase the assessments, distrain the goods and chattels of citizens, or even to preserve the forms of legal exaction for such a purpose, are measures which it is hard to believe either politic, scriptural, or just. The pecuniary supplies required for religious objects are to be secured, according to Voluntaryism, solely through the operation of moral influences and sacred motives. Truth, as well as error, must be left to provide for itself. The responsibility and privilege of providing for the support of Christianity having been attached by Christ to his church, it is further his law that its institutions shall be maintained and extended by the voluntary liberality of its friends. A primary obligation rests on those enjoying the services of a pastor to provide according to their ability for his maintenance, on the apostolic principle—"let him that is taught in the word communicate to him that teacheth in all good things;" while, on the equally apostolic principles, that the laborer is worthy of his hire, and that the strong should aid the weak, a mutual and collective responsibility remains with the general membership, to supply each other's ecclesiastical necessities, and to unite in measures that may provide an adequate remuneration to the pastors or other ministers of the church. Civil establishments of religion, together with all forms of state endowments and grants for religious purposes, are thus condemned by Voluntaries as human expedients, adverse to Christian development and the working of the law of self-support, which alone draws forth the resources, and edu-

cates the consciences and habits of the people. Inadmissible, as introducing the compulsory element into the free and delicate movements of Christian society, and intruding magistracy into a sphere which the history of all struggles for the higher liberty teaches must be preserved to the individual and the church, these institutions tend to foster political dependence and class-feeling among the recipient bodies, and prevent those relations of honorable trust and responsibility which best unite pastors and people. These views express what may be called ecclesiastical Voluntaryism. On the question of education, various shades of opinion exist among Voluntaries. All are agreed that the religious education of the young belongs to the parent and the church, and is not to be provided or superintended by the state. How to secure this principle in connection with a system of national schools or government grants for education, continues to be the problem of Voluntaries. Some seek the solution in a plan of local boards representing the parentage and community, who shall manage the schools, and decide the character of the teaching; and of these, some advocate separation of the hours for religious and secular lessons. Others, who think that while by these methods state superintendence may be avoided, state aid is yet directly or indirectly received for religious instruction, would accept a system which provided simply for schooling in secular or common branches. Those known as Voluntary educationists reject the idea of any national system, some on account of the religious difficulty, and others on grounds connected with the philosophy of education and the theory of government. Voluntary educationists would leave the education of the poor to be secured by the operation of those influences which originate and sustain other necessary and benevolent measures. The education of the children of classes not necessitous they expect to flow from private enterprise and free association. Voluntaries consistently object to grants to denominational schools dependent on the condition of teaching religion, to grants to ragged schools and all semi-religious institutions, as well as to the appointment and payment by the state of chaplains for prisons, the army, etc. In reference to the Sabbath, holding the sacred character of the day, some Voluntaries appear to admit that the magistrate is both entitled and bound not only to make it a *dies non* in his own department, but also to prohibit labor and amusements throughout the nation. Others, equally holding the morality of the day, with more regard to strict theory, deny him the power of inflicting pains and penalties, however mild, in a matter radically religious, at the same time that they assert the obligation of the state to secure all its members due protection and facility in the practice of their worship, and to make such laws for this end as may be fit, in view of prevailing religious observances. Regarding national fasts and thanksgivings, most Voluntaries hold that the style of authority in which royal proclamations appointing these have usually been expressed is objectionable, as assuming a right to prescribe the topics and language of devotion, and to regulate its seasons, and insist that the language of invitation should be substituted for that of command. Some, while ready to comply with an invitation of the sovereign to join in an offering of prayer on occasions they judge suitable, do not allow that it forms any part of magisterial duty to issue such appeals, or that the royal act imparts a national character to the service. Ordinary political acts become national when done by the proper national organs; but no religious acts can acquire a national character except they are participated by the body of the people. When this is the case, the exercise is national, though not evoked by the call of the chief of the state, and it is not made more national by that call. The advantage of simultaneousness and unity is attainable on the widest scale by the natural concert of churches apart from royal initiative, which, if it may be followed when right, need not be waited for as indispensable to true national worship. On the question of marriage, Voluntaryism, recognizing its character as a civil transaction, demands that all religious parties stand on the same level in regard to it. Withholding legal sanction from all immoral connections, and punishiug breaches of the lawful contract, magistrates are not warranted to visit with penalties any mere departure from the standard prescribed to Christian conscience, or embodied in ecclesiastical law. Political Voluntaryism, as it is sometimes called, is simply Voluntaryism expressed in the language of the politician—the doctrine of the entire religious equality of all citizens in the eye of law, stated and defended without reference to specific religious opinions, and in the way of appeal to principles generally received.

VOLUNTEERS—the great defensive citizen-force of Great Britain, in some degree corresponding to the national guard of continental states. It is essentially self-supporting, and wholly unpaid; although government arms the men, and contributes a certain sum toward the corporate expenditure. The oldest volunteer corps is the "honorable artillery company" of the city of London, which dates from the reign of Henry VII.; although still called artillery, it comprises artillery, cavalry, and infantry, and is probably the oldest armed body in Europe.

The volunteer force of Great Britain is now a form of militia, and owes its origin to the feeling of alarm which in 1859 pervaded England by reason of the alleged unfriendly designs upon that country of Napoleon III. Since then the volunteer forces have been organized by the government, which provides adjutants, drill-masters, and a staff of inspectors. The force cannot be used in times of civil disturbance, but only in case of actual or threatened invasion. In 1891 the volunteer force numbered 260,627 men. See Militia.

The American Congress, by an act passed 1792, recognized the existence, in many of the states, of volunteer organizations not included in the militia of those states; and it has since, from time to time, raised volunteers for temporary purposes. Such troops were U. S., rather than state forces; their officers were appointed by the president. In the Mexican war the volunteer forces amounted to some 30,000. In the late civil war, congress, by an act passed 1861, authorized the president to accept volunteers to a number not exceeding 500,000, whose time of service was to be fixed by the pres. at not less than six months, nor more than three years, and who were to be disbanded at the end of the war. The call was to be equalized among the different states; the governors of each of the states had to commission the officers. These troops were subject to all the rules and regulations of the U. S. army. Again, in 1862, the pres. was authorized to make a call for volunteers, at the same time offering a bounty; and it was by this method and by enforced drafts that the army was raised. The power of raising armies vested in congress by the constitution enables it to place a large volunteer force in the field, should occasion arise. At the end of the period for which the men have been enlisted, they are mustered out of the service.

VOLU'SIA, a co. in e. Florida, having the Atlantic ocean for its e. boundary; organized 1825 as Mosquito co. and subsequently as Orange; 1288 sq.m.; pop. '90, 8467. Soil productive for oranges and other fruits. Co. seat, Deland.

VOLUTE, in architecture, the spiral ornaments of the Ionic and Corinthian capitals, probably derived from Assyrian architecture, in which it is also used.

VOLU'TIDÆ, a family of gasteropodous mollusks, of the section *pectinibranchiata*, all marine, having a spiral shell, which is turreted or convolute, the aperture notched in front, the *columella* obliquely plated; no operculum. The animal has a very large foot, and a recurved siphon. The species are numerous, and abound chiefly in tropical seas. Many of them have very beautiful shells, much prized by shell-collectors. Several small species are found on the shores of Britain, of which *voluta tornatilis* is the only one that is not rare. This genus makes its appearance in the cretaceous strata, and increases in numbers in tertiary deposits, no less than 50 species being known in the pleistocene.

VOLVOX, a genus of minute organisms, the type of a family called *volvocineæ*, now regarded as vegetable, and ranked among *protophytes*, but which were at first supposed to be animals, and were reckoned by Ehrenberg among *infusoria*. They are globular, or nearly so, are found in stagnant water, and move slowly through the water, revolving round an axis, by the agency of numerous cilia (q.v.), which project from their surface; one pair arising from each of the numerous component cells of the sphere, and passing through their common gelatinous envelope. Both sexual and asexual multiplication take place; in the former case, certain cells enlarge to form oospores, while others divide and redivide, so producing a mass of tiny segments, which are set free as ciliated antherozoids, and unite with the oospores, which ultimately divide to form new colonies. In asexual multiplication, eight cells of the ball undergo repeated division, so forming new spheres, which are set free by the breaking up of the parent. These frequently exhibit, even while within the parent globe, a rotary motion similar to its own. The presence of starch in the interior of the *volvocineæ* has been detected by means of iodine, and is regarded as a conclusive proof of their vegetable nature. The most common and best-known species is *volvox globator*, which is just visible to the naked eye. It is a transparent sphere, having its surface studded with innumerable green spots, united by a beautiful net-work. From 6 to 20 young are often to be seen in its interior.

VOLVULUS (Lat. *volvere*, to twist) is the term used in medicine to signify a twisting of the intestine, producing obstruction to the passage of its contents. There are three distinct varieties of rotatory movement capable of giving rise to volvulus—(1) A portion of intestine may have become twisted on its own axis, and, in that case, even semi-rotation brings the intestinal walls into contact, so as to close the passage. This is a rare condition, and only occurs in the ascending colon. (2) The mesentery (q.v.), or a part of it, may be twisted into a cone, dragging the intestine with it; the mesentery being the axis, and the intestine being rolled up upon it. This form occurs in the small intestine. (3) A single portion or a coil of intestine may afford the axis round which another portion, with its mesentery, is thrown, so as to compress it, and close the passage. A coil of small intestine, the sigmoid flexure or the cæcum (see DIGESTION, ORGANS OF), may form the axis. All these varieties occur chiefly in advanced life, and their seat is commonly toward the posterior unyielding wall of the abdominal cavity, the smoothness and yielding nature of the parts anteriorly rendering such an event almost impossible. The *symptoms* of twisting of the intestines, especially of the sigmoid flexure, which is the most common seat of the affection, are usually very well marked from the beginning. Great pain is suddenly experienced in a small circumscribed spot of the abdomen, obstinate constipation usually setting in from that date. If the sigmoid flexure, which lies just above the rectum, is the seat of the twisting, the abdomen soon becomes distended, especially on the left side, the distention being much more marked than when the twist is in the small intestine, as might physiologically have been expected. Vomiting, often constant and copious, is usually present. These cases are so desperate in their nature

that it is needless to enlarge upon their treatment. Attempts to remove the displacement by injecting water or air into the intestine by means of a long tube have often been made, but with very slight success. Mr. Pollock, in his article on "Disease of the Alimentary Canal," in Holmes's *System of Surgery*, remarks that "relief in twist of the sigmoid flexure is just possible without opening the abdomen, provided the long tube be introduced into the distended gut, its contents drawn off, and the twist be reduced by the altered position of the bowel. But no operation for the ultimate relief of the patient will be successful unless the intestine be unloaded first, and the twist then reduced."—Vol. ii. p. 158. The operations that have been proposed for the relief of this and other intestinal obstructions are so often fatal, and, even when successful, leave the patient in so wretched a state, with an artificial outlet for the discharge of the contents of the bowels, that it is doubtful whether they should be recommended. It is simply a choice between almost certain death in a few days and a possible chance of a prolonged (but usually a miserable) existence. There are, however, a few rules that should be universally known and attended to—viz., wherever symptoms such as we have described occur, aperients should only be given by the rectum, while opium should be freely given by the mouth. Leeches and hot fomentations should be applied to the seat of pain; and all solid food should be prohibited, the nourishment being given solely in the fluid form.

VO'MER, a bone which, in the human skeleton, forms part of the middle partition of the nose, and the lower edge of which fits into grooves between the apposed surfaces of the palatine processes of the upper jaw and palate-bones. It exhibits many modifications in the different classes of *vertebrata*. Its position is indicated in the figure of *archetype vertebrate skeleton*, in the article SKELETON. It is specially noticed here because of the frequent occurrence of the term vomer in articles on fishes—a very important character being often found in the presence or absence of teeth on the vomer; that is, along the middle line of the roof of the mouth.

VOMITING consists in the stomach emptying itself through the gullet and mouth. It is preceded by a feeling of nausea, a flow of saliva in the mouth, and the breaking out of perspiration; the countenance grows pale, a feeling of weakness spreads over the whole body, and the pulse becomes slow. At last the muscles of the abdomen and the diaphragm strongly contract, and the whole contents of the stomach are ejected with greater or less violence. The first matters to be ejected are the food and drink present, then mucus from the stomach and esophagus, and lastly, bile from the duodenum. In cases of disease, abnormal substances are sometimes vomited, such as blood, fragments of the intestines, and even excrementitious matters. When the vomiting is over it is followed by languor and drowsiness, or, if the excitement was inconsiderable, the usual state immediately returns.

The causes of vomiting are various. In the first stages of infancy it is almost normal, and occasions no disturbance of the system. In many animals, too, it is a normal function of life, as when birds of prey reject the hair and feathers of their victims. The infant gets rid of the superabundant milk it swallows by throwing it up with no trouble. Some persons can excite themselves to vomit by swallowing air.

The immediate causes of vomiting may be reduced, according to Dr. Carpenter, to the three following categories: "(1) The contact of irritating substances with the mucous membrane of the stomach itself; these, however, cannot act by *direct* stimulatiom upon more than its own muscular coat; and their operations upon the associated muscles must take place by *reflexion* through the nervous circle furnished by the pneumogastric and the motor nerves of expiration. (2) Irritations applied to other parts of the body, likewise operating by *simply-reflex* transmission; as in the vomiting which is consequent upon the strangulation of a hernia, or the passage of a renal calculus; or in that which is excited by the injection of tartar emetic or emetin into the circulating current, when these substances probably produce their characteristic effect by their operation on the nervous centers. (3) Impressions received through the *sensorial* centers, which may be either sensational or emotional, but which do not operate unless they are *felt*. In this mode seems to be excited the vomiting that is induced by tickling the fauces, which first gives rise to the sensation of nausea; as well as the vomiting consequent upon disgusting sights, odors, or tastes, and upon those peculiar internal sensations which are preliminary to sea-sickness. The *recollection* of these sensations, conjoined with the emotional state which they originally excited, may itself become an efficient cause of the action, at least in individuals of peculiarly irritable stomachs, or of highly sensitive nervous systems."—*Principles of Human Physiology*, 6th ed., p. 77.

According to the oldest doctrine respecting vomiting, it was held to arise solely from convulsive movements of the stomach, which was thought to take on a motion contrary to the usual peristaltic motion. Bayle advanced the opinion, that the stomach is quite passive in the operation, and that its contents are emptied entirely by its being compressed through the contractions of the abdominal muscles and the diaphragm. An apparently conclusive experiment of Magendie's, in which the stomach was removed, and a bladder substituted for it, had more recently (in 1813) satisfied most physiologists as to the passiveness of the stomach in vomiting, until Béclard and Budge showed the insufficiency of his experiment. It is found, in fact, that in vomiting there are two sets of actions, viz. (1) contractions of the abdominal walls, while the diaphragm remains

fixed, and forms a support to the stomach, and (2) the stomach itself performs jerking movements, the pylorus, or inferior orifice, at the same time closing, while the cardiac sphincter relaxes, without which last-named action vomiting is impossible; and that either of the two kinds of movement—the abdominal or the stomachal—may eject the contents of the stomach into the gullet.

In the treatment of vomiting, we must consider it as a symptom rather than a malady. Where the stomach is irritated, relief is afforded according to circumstances, by drinking cold water, aerated or soda water, or, if necessary, by opium or nux vomica. Cold applications outwardly also do good. In other cases, infusions containing ethereal oils —camomile, coffee, etc.—astringents, or correctives for acidity—magnesia, soda, etc.— are the fitting remedies. When the irritation is in the brain, the best remedy is a horizontal position, with composure and darkness. If a person in sound health is suddenly seized with vomiting poisoning may be suspected.

VONDEL, Joost van den (pr. *Vōst*), the greatest Dutch poet, was born at Cologne, Nov. 17, 1587, his parents, who were Anabaptists, having fled from Antwerp to avoid persecution. His maternal grandfather, Peter Kranen, ranked among the poets of Brabant. When freedom began to raise the head in Holland, the elder Vondel removed with his family to Utrecht, and afterward to Amsterdam, where he prospered in trade. The poet's education in boyhood was limited to reading and writing, but his perseverance and love of study enabled him in after-life to become intimately acquainted both with ancient and modern literature.

At the early age of 13, his poetical efforts were praised by Hooft. In his 23d year, he married Maria de Wolf, to whose clever management Vondel chiefly left his business as a hosier, while he devoted himself to study and poetry. The tragedies of Vondel are very numerous, and the grandest specimens of Dutch literature. His satirical writings and epigrams are full of fire, energy, and spirit. One of his most remarkable pieces is *Lucifer*, published in 1654, strikingly resembling Milton's *Paradise Lost*, which appeared thirteen years later. Vondel took an earnest and active part in favor of the Remonstrants, Grotius and Oldenbarneveld, drawing down on himself the anger both of the clergy and court, whom he attacked with the keenest satire.

Gysbrecht van Aemstel, Adam in Banishment, Palamedes, The Batavian Brothers, Solomon, Samson, Adonijah, Noah, or the Destruction of the Old World, Mary Stuart, etc. are splendid efforts of genius. *The Harpoon, The Horse-comb*, and the *Decretum Horribile* are stinging satires on the ruling powers both in church and state. Vondel's translations from the Greek and Roman writers are numerous, the *Metamorphoses* of Ovid having been rendered into Dutch verse when he was 84 years old. Vondel left no subject untouched, no measure untried. His works (9 vols. quarto) contain many sea-songs, and more than 100 odes. Many of the later poems were written with a strong Roman Catholic spirit, he having joined that church about 1640. Through the imprudences of his son, to whom he had given his business, Vondel fell into straitened circumstances, and in 1658 accepted a situation in the city pawnbroking office. In 1668, the magistrates allowed him to retire with his salary of 650 guilders yearly, which kept him above want. He was of moderate stature, well made, and had an eagle eye. After his powers of body and memory had begun to fail, he could still read without glasses. He died calmly, 1679, aged 91. Fourteen poets acted as his pall bearers.

VONITZA, a town on the coast of Greece in the province of Acarnania and Aetolia, on the southern shore of the gulf of Arta and about 48 m. n.w. of Mesolenghi. Pop. about 3000.

VON SIEBOLD, Karl. See Siebold, Karl von.

VON SYBEL, Heinrich. See Sybel, Heinrich von.

VOODOOISM is a species of demonology in vogue especially among the Creole negroes of La., and said to have been derived from their ancestors in Africa. St. John's eve is devoted to the mystic rites of the Voodoos; they gather in some secluded spot, and there they go through their Voodoo dances and contortions, accompanied by a rude kind of music. Their magic is said to consist in a knowledge of several very subtle poisons, which produce a slow and lingering death through exhaustion. Their power is much feared by the other negroes.

VOORHEES, Daniel W., b. in O., 1827; graduated, Asbury university, 1849; studied law and practiced in his native state. He became a democratic politician of influence, was U. S. district attorney, 1858–61, and served as member of congress from 1861 to 1865, and from 1869 to 1871. In 1877 he was appointed U. S. senator to complete an unexpired term, and in 1879, 1885, and 1891 was elected for full terms. He d. in 1897.

VOORNE-EN-PUTTEN, the name of an island belonging to the province of South Holland, lying between Haring Vliet and the mouth of the Meuse, west of Beijerland. Originally two islands, the soil has gradually become continuous through the silting up of the river that cut through it. The island is traversed by the Voorne canal, emptying into the Haring Vliet near Helvoetsluys.

VOPADEVA is a celebrated grammarian of India. He wrote a grammar entitled *Mugdhabodha*, which is held in high repute, especially in Bengal, and was commented upon by *Durgadâsa*. (Both text and commentary have been edited at Calcutta in 1861; previous editions contain merely the text of Vopadeva's grammar). It differs from the

great work of Pân'ini (q.v.) in its arrangement as well as in its terminology; and without commentary of Durgadâsa, would not yield by far the information that may be derived from Pân'ini's grammar.

VORANT, in heraldry, a term applied to an animal represented as swallowing another; as, sable, a dolphin naiant; vorant a fish proper.

VORARLBERG, a district of west Austria, which with Tyrol forms the administrative province of Tyrol and Vorarlberg, which has an area of 11,324 sq. m., and a pop. (1890) of 928,769. Vorarlberg alone has an area of 1005 sq. m., and a pop. '91, of 116,073. It is bounded by Bavaria and on the n. and n.e., Grisons on the s., Liechtenstein and St. Gall on the w., and lake Constance on the n.w. It is traversed by the Arlberg mountains, from which it takes its name. It is drained by the Aach, Ill, Fussach, and Lech rivers. The soil is fertile, producing fruit, wine, cereals, and dairy products. Capital, Bregenz.

VORMEN, a river in Norway, 200 m. long, rising by many heads in the Langfield and Sagnefield mountains. It is 2000 ft. above the level of the sea, and, flowing through the valley of the Gudsbransdale, expands into the lake of Mjösen. Above the lake it is called Laugen; from this point to the Glommer, 28 m. n.e. of Christiania, it bears the name of Vormen. The lake, 80 m. long and 8 m. broad, 600 ft. above the sea, is the center of a brisk trade, and the river through its entire length teems with salmon and salmon-trout.

VORONE'J, or VORONETZ (pronounced *Voronesh*), a government in the s. of Great Russia, bounded on the s. by Little Russia and South Russia. Area 25,443 sq. m.; pop. '94, 2,755,400, consisting of Russians and German colonists. It is watered by the Don, its two navigable tributaries, the Voronej and Khoper, and other streams. The soil, mostly a black mold, is generally fertile, and great crops of grain—wheat, rye, barley, oats, and millet (which supply the inhabitants and local distilleries, and are exported)—are produced. Cattle and horses of a good breed are reared; the best studs belong to the crown. The principal manufactured articles are oil, brandy, beer, cloth, beet-root, sugar, skins, wax candles, soap, tobacco, and potash; and corn, tallow, hemp-seed, cattle, and horses are exported. Capital, Voronej.

VORONE'J, a t. of Great Russia, capital of the government of the same name, stands on the right bank of the Voronej, 150 m. s.w. of Tambov. It was founded in 1586 as a bulwark against Tartar invasion. Peter the Great, who had previously visited the town, built a fortress and a dockyard here in 1694. Besides two cathedrals, the town has many important civil, ecclesiastical, and educational institutions. The commerce of Voronej is extensive, the chief articles of trade being corn, hemp-seed, and tallow. Pop. '97, 84,015.

VORONTZOFF, MIKHAIL, 1772–1856; b. St. Petersburg; entered the Russian army and took part in the campaign against the Turks, and against Napoleon. He was appointed governor-general of South Russia and Bessarabia in 1823, and succeeded Menshikoff in 1828. He became governor of the Caucasus in 1844, conducted a campaign against Schamyl, and resigned from the army in 1854. In 1856 he was given the title of field marshal, and made governor of Odessa.

VÖRÖSMARTY, MIHÁLY, 1800–55; b. Hungary; studied law in Pesth, but devoted himself to literature. Of his epic poems, *Zalán Futâsa* and *Eger*, and of his dramas, *King Salomon* and *Kont*, are the best. His patriotic song, *Szózat*, was immensely popular in the revolution of 1848. At the time of his death he was engaged in translating Shakespeare into the Hungarian language.

VOR'STIUS, CONRAD, 1569–1622; b. Cologne; studied at Heidelberg; appointed professor of divinity at the gymnasium of Steinfurt. From his published treatises, *De Prædestinatione*, *De Sancta Trinitate*, and *De Persona et Officio Christi*, he was suspected of Socinianism, but made a satisfactory defense at Heidelberg; succeeded Arminius as professor of theology at Leyden, 1610; wrote a treatise, *De Deo*, which was burned by the hangman in London and Oxford; was deposed, 1612, and condemned by the synod of Dort as a heretic, 1619.

VORTEX (Lat. a whirlpool). Till lately, it was a reproach to hydrodynamics that the theory of vortices or eddies in fluids had not been properly brought under the domain of mathematical analysis. Even now, the problem has only been partially solved by the labors chiefly of Stokes (q.v.) and Helmholtz (q.v.), as their beautiful investigations apply only to *perfect* fluids, that is, fluids which oppose no frictional resistance to change of shape. In ordinary motions of perfect fluids, such as currents and waves, the instantaneous change of shape of a small spherical portion makes it an ellipsoid by simple extensions and compressions *without* rotation. The essential characteristic of vortex-motion is, that it involves rotation of some parts of the fluid. Helmholtz has shown that this rotational or vortex-motion remains with the parts of the fluid which first have it, and cannot be transferred. We can conceive no process by which vortex-motion could be given to, or taken from, a perfect fluid; for to our reason fluid friction (which does not exist in a perfect fluid) would seem to be indispensable. On such abstruse subjects we cannot of course enter here; but one result of Helmholtz's investigations is so curious that we must mention it. We are all familiar with those singular smoke-rings which are produced when a mortar is fired; or when, on a smaller scale, a bubble of phosphurcted hydrogen takes fire in air, or a smoker skillfully emits a puff of tobacco-smoke. A

very simple mode of producing them, on even a large scale, is to bore a hole in one side of a box, remove the opposite side, and substitute a cloth or sheet of india rubber for it. A slight blow on this membrane ejects a vortex-ring from the hole. To make this vortex visible, we may burn phosphorus or moistened gunpowder in the box; or still better, sprinkle its interior with ammonia, and introduce a vessel containing common salt and sulphuric acid. The sal-ammoniac cloud which fills the box is admirably adapted to display the rings. Besides a progressive motion as a whole, the ring revolves about its own central or medial line. Suppose two such rings to follow each other, with their planes parallel, and their centers moving in the same line, Helmholtz shows that (at least in a perfect fluid) the foremost will relax its speed, and spread out into a larger ring, while its follower will contract, and quicken its pace, till it passes *through* the other, which in turn becomes the pursuer, and so on. This very curious result may be realized in a tea-cup, by drawing the half-immersed bowl of a tea-spoon along the surface of the tea for a short way, and withdrawing it. Two little whirlpools, or vortices, are then seen moving side by side. They are sections of the half vortex-ring which has been formed in the liquid by the spoon. A second half-ring may be at once sent after them by another stroke of the spoon, and the phenomenon above described will be obtained. When, on the contrary, two such vortex-rings *meet*, their centers moving in one line, they both spread out, and relax their speed indefinitely. This is obtained in a liquid by letting the half vortex-ring impinge directly on the side of the vessel, when it spreads out, and relaxes its speed; just as if there were no boundary of the fluid, but a second vortex-ring occupying the place of the image of the first which would be formed by a plane mirror substituted for the side of the vessel. When one vortex-ring impinges obliquely on another, it rebounds from it, and both are thrown into vibration, their form of equilibrium being circular. They act in fact in this respect like solid India rubber rings. By forming them from an elliptic aperture, they are produced in a state of vibration. A square aperture gives them in a different state of vibration.

The impossibility of producing or destroying vortex-rings in a perfect fluid—save by creative power—has led sir W. Thomson (q.v.) to regard the ultimate parts of matter as vortices of various kinds in a perfect fluid.

The word vortex has also come into use in connection with Descartes's once celebrated theory of the universe, given in his *Principia Philosophiæ*. In this the rotation of the planets about the sun, the satellites about the planets, etc., were explained (!) by the hypothesis of vortices forever whirling about the central body. Descartes was a good mathematician, but in natural philosophy he preferred metaphysics to experiment, and of course erred enormously. But he is not to be laughed at: mistakes more ridiculous than his are gravely propounded at the present day.

VORTICEL'LIDÆ, a family of *infusoria*, remarkable for beauty, and containing a great number of species, to which, from their form, the name of *bell* or *bell-flower animalcules* is often given. The genus *vorticella* consists of minute cup-shaped or bell-shaped creatures, each placed at the top of a long flexible stalk, the other end of which is attached to some object, as the stem or leaf of an aquatic plant. Around the edge of the bell or cup is a fringe of rather long cilia, the motion of which brings food to the mouth. The stem is flexible, and is sometimes stretched out to its full length, sometimes contracted in a spiral form. The contraction takes place instantaneously upon any alarm, the cilia at the same time vanishing; and it is very interesting to watch a group of *vorticellæ*, which may often be easily done with a Coddington lens, when they adhere to the inside of the glass of an aquarium. The stem is often beautifully branched, the *vorticella* becoming a compound animal, like many zoophytes, and the whole contracts or is extended at once, The stem, slender as it is, is a tube, through the whole length of which runs a minute muscular thread. A cup or bell of a *vorticella* sometimes develops a new fringe of cilia at its point of junction with the stem, becomes detached from the stem, and begins to move freely through the water, till it finds a new place on which to fix itself, reproduction thus taking place by gemmation. Reproduction also takes place by encapsulation. See INFUSORIA. To the family vorticellidæ belongs the genus *stentor*, having a trumpet-shaped body, and therefore receiving the popular name of trumpet animalcules. They swim freely through the water, at the same time rotating on an axis, and attach themselves to objects by a sucker at the lower or narrow end. They have a fringe of cilia round the mouth, and the body of some species is covered with cilia. They are very voracious. They may often be found adhering to a twig or the stem of an aquatic plant, collapsed into minute masses of green jelly.

VOSGES, a dep. in the n.e. of France, formed out of the s. part of the old province of Lorraine, is bounded on the n. by the departments of Meuse and Meurthe, and on the e. by Alsace-Lorraine. Area, 2,266 sq.m.; pop. '96, 421,412. The surface is mountainous the territory being traversed not only by the Vosges mountains, which run along its e. border, but also by the Faucilles mountains, which cross the dep. from e. to west. The chief rivers are the Moselle, and its tributaries the Meurthe, Madon, and Mortagne, all of which flow in a N. or N.W. course through this department. The mountains in the e. are covered with vast forests of beech and fir, and at the base of the mountains are tracts of pasture or rolling infertile plains. The w. part of the dep. called the *plaine*, is very fertile in cereals, vegetables, and fruits. Among the hills, the

climate is cold; on the plains it is humid. An excellent cheese, called Géromé, is produced. Embroidery, cotton and linen goods are produced, and bleaching and dyeing are carried on. Mineral riches abound, there being iron, lead, copper, cobalt, and antimony mines. The dep. is divided into the five arondissements, Épinal, Mirecourt, Neufchâteau, Remiremont, Saint-Dié. The capital is Épinal.

VOSGES MOUNTAINS (Lat. *Vogesus*, Ger. *Vogesen* or *Wasgau*), a range of mountains in the n.e. of France and the w. of Germany, run from s. to n., on the left bank of the Rhine, from the borders of the departments Haute-Saône and Doubs, n. to Mainz, and separate Alsace from the French departments of Vosges and Meurthe and the German Lorraine. The range runs parallel with the Schwarzwald or Black Forest in Baden and Würtemberg, on the right bank of the Rhine, and forms the western border of this part of the Rhine basin. The summits are rounded and regular in outline, and are called *ballons*. The chief of them are the Ballon de Guebwiller, 4680 ft.; le Hobeneck, 4429 ft.; and the Ballon d'Alsace, 4085 feet. They are covered with forests, and there are some minerals, coal being the most important.

VOSS, Johann Heinrich, one of the foremost classical writers of Germany, was b. in 1751 at Sommersdorf in Mecklenburg, of poor parents. In 1772 he went to the university of Göttingen, and there joined the "Hainbund," an association of young poets, at the head of whom stood Bürger and Boje. Voss first intended to devote himself to theology, but soon exclusively turned to Greek and Roman antiquities, under Heyne's auspices. In 1778 he went from Wandsbeck, whither he had gone for the purpose of editing the *Musenalmanach*, to Otterndorf, in Hadeln, where he prepared his translation of the *Odyssey*. This appeared in 1781, and was received with universal applause. In the next year he became rector of Eutin, whence, in 1789, he issued his German translation of Virgil's *Georgics*. This was followed, in 1793, by a new and revised edition of the German *Odyssey* and *Iliad*, which, however, did not meet with as favorable a reception as the first. His contests with Heyne (q.v.) gave also rise chiefly to his *Mythological Letters*, which appeared in 1794. Among his purely German poetical works, *Luise*, an idyl (1783, revised 1795), takes a foremost place. In 1799 he issued the whole of Virgil in a German translation. In 1802 he went to Jena, where he wrote the celebrated review of Heyne's *Iliad*. In 1805 he was called to Heidelberg, where he wrote annotated German translations of Horace, Hesiod, Theocritus, Bion, Moschus, Tibullus, and Lygdamus. In 1821 he published a translation of Aristophanes, and a new edition of Horace and Virgil. Among other literary labors must also be mentioned his translation (with the aid of his two sons) of Shakespeare's works, which, however, is very inferior to Schlegel's. In opposition to Creuzer's *Symbolik*, he wrote an *Antisymbolik* (1824), in which he lifted up his voice against exaggerated praises of heathen mysticism; and one of his last papers was a violent denunciation of his former friend Stolberg, who had turned Roman Catholic. He died at Heidelberg in 1826. Among his translations from modern languages may be mentioned that from Galland's *Arabian Nights*, and that of Shaftesbury's works. A brief mention may also be made of his two sons: (1) Heinrich, b. 1779, a philologist of merit, who assisted his father in his Shakespeare translation, and who was a great friend of Jean Paul's. He had intended to edit the latter's works, but died before him, in 1822. (2) Abraham, b. in Eutin, professor of the gymnasium at Kreuznach, who completed the Shakespeare translation. He died in 1847.—See Paulus, *Lebensund Todeskunden von J. H. Voss* (Heidel. 1826).

VOSSIUS, Gerard, one of the most distinguished scholars of the first half of the 17th c., was b. of Dutch parents near Heidelberg, where his father was a Protestant minister. His father's name was John Voss, but he, after the fashion of the time, had Latinized it into Johannes Vossius, and hence his son called himself Gerardus Johannes Vossius, that is, Gerard, the son of John. In 1578 the family returned to Holland, and settled at Dordrecht, where Vossius went to school. He afterward distinguished himself at the university of Leyden; and when 22 he returned to Dordrecht, to become the principal of the school, of which he was the most distinguished pupil. He married shortly afterward, but his wife died in 1607, leaving a family of three children. In the same year, he again married, and by his second wife he had two sons and five daughters. In the earlier part of his life, Vossius does not appear to have published much, but he became known to his countrymen as a scholar and theologian; and his assiduity in study may be inferred from the fact that he would never allow a friend to stay with him more than a quarter of an hour. In 1615 he became principal of the theological college of Leyden, and while holding this appointment, published a work on Pelagianism (*Historia Pelagiana*). In it he spoke of the Arminians in an apologetic tone, and thereby brought down upon himself the wrath of a large section of the Dutch clergy; which caused him to be deprived of his office in the theological college, and of the income derived from it. His work had attracted attention in England, and it was some compensation to him that he received from archbishop Laud an office which brought him £100 a year without its being necessary he should live out of Holland. Chiefly, it appears, to secure the means of supporting his family, he retracted the opinions he had expressed, in his book *De Historicis Latinis*, published in 1627, and he became reconciled to the church. In 1631 he was appointed professor of History in a new university at Amsterdam, where he seems to have devoted himself to the completion of the great works on which his fame

rests. Among the most important of these not mentioned above were. *Aristarchus sive de Arte Grammatica, Libri VII.; De Historicis Græcis, Libri IV.; Commentariorum Rhetoricorum sive Oratoriarum Institutionum, Libri VI.; De Veterum Poetarum Temporibus, Libri II.* In 1649, Vossius was climbing the ladder of his library when it broke; he fell under the shelves and books, and died of the injuries he received.

The children of Vossius were remarkable for beauty, accomplishments, and learning. Grotius said of Vossius in epigrammatic Latin, that it was doubtful whether by his books or his children he had contributed most to adorn the age. Five of his sons, Denis, Francis, Gerard, Mathew, and Isaac, are known as authors.

VOSSIUS, Isaac, a scholar and theologian, was the only son of Gerard Vossius who survived him. He was born at Leyden in 1618. When 21 he published an edition of the *Periplus* of Scylax, the Greek geographer, with a Latin translation and notes. He afterward traveled in Italy, collecting valuable manuscripts. In 1648 he took up his abode at the court of queen Christina of Sweden; but in 1658, in consequence of a quarrel with Salmasius, he returned to Holland. In 1670 he came to England, and here, although he openly scoffed at religion, he was appointed by Charles II. a canon of Windsor, and had apartments assigned him in the Castle. He died there in 1689, and it is recorded that on his death-bed he refused to take the sacrament, until one of his colleagues argued that he ought to do so for the honor of the chapter. His works are numerous, but not so important as those of his father.

VOTING BY MACHINERY. Every one possessing the privilege of suffrage is supposed to read and understand the special routine laws governing the act of voting. Yet the wording of such enactments will rarely leave an impression on the minds of more than 25 in 100 voters, and an expert authority has said that there are never more than 15 persons out of 100 who have in their minds an accurate idea of the meaning of the law. Suppose a voter wishes to drop certain candidates on a party ballot and substitute others. In a few cases he may have made his selections beforehand, but the great majority of those exercising the franchise are not apt to take such precautions. Then the confusion begins, and it is well known that the act of procuring slips of, say, a Republican candidate by a Democrat is often a source of personal annoyance. Absolute secrecy in voting becomes impossible, and there is no question but that the character of the ballot, whatever it be, is known to some one in the polling-booth as soon as it is seen.

A cynical political statistician has said that twenty per cent. of all elections held in the United States were effected by "fraudulent returns." That, even when intentions were honest, there was a constant five per cent. of error. That the larger the vote, with an increasing number of candidates, the greater the errors. That there was rarely a "voting balance account" which was not forced. The conclusion arrived at was that to bring about a wrong count, or a "hitch," was that exact condition the political trickster was striving for. In delay was victory—for the side which massed the rascals. It is not worth while to dilate on the methods employed by political tricksters to defraud the honest American citizen of his rights. The materials already collected are as voluminous as they are startling. That they should have been carried out so long shows the apathy of "the intelligent voter."

Human means being apparently unable to cope with the difficulty, the question has been asked repeatedly, Can the actual business of voting, with the necessary factors of secrecy, accuracy, ease, and speed, be encompassed by a mechanical device? That one element, speed, would mean not alone rapidity in the personal act of voting, but ability to sum up at once the total results of the canvass, to eliminate the vexatious delay in additions, to nullify the blunders of indifferent accountants, and to keep besides the exact tally of all the voters who had entered the polling-booth. A recent invention known as the Myers Ballot machine accomplishes these results with perfect success.

This ingenious device may be described as a small steel room with a door of access and of exit. It is easy to get in, to vote, and, after voting, to get out again; but when the voter goes out, and is in the vestibule of the booth, he cannot return to vote if he be a repeater, for then the whole of the voting mechanism, entrance door and all, is locked up. It is only when he emerges entirely that the door of the entrance is open again. Then, too, the voting mechanism is released. The man is seen by those outside to have gone through with his voting, and he cannot return. The individual action of opening or closing a door by the voter does the whole business for him.

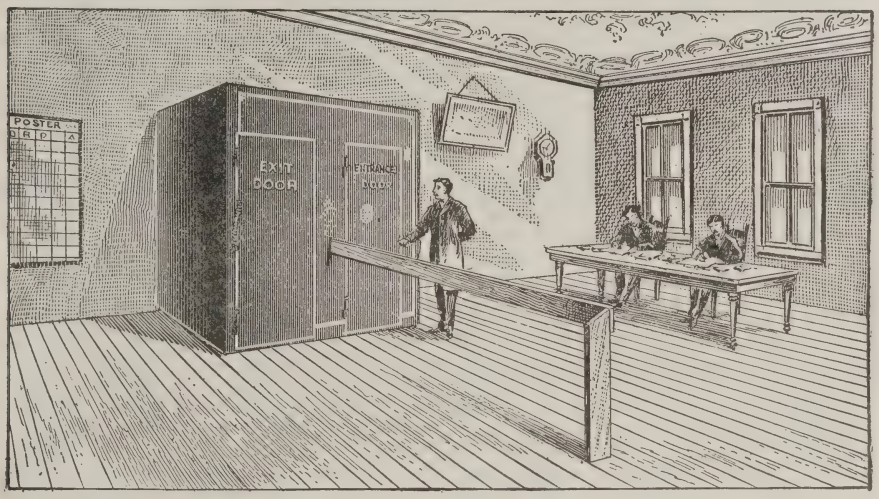
Before the voter enters the steel booth he has consulted the lists prepared by the proper authorities. That is always done. The journals invariably print them in their regular order, a governor standing at the head of the list, and, say, the game-constable last.

It has been suggested over and over again that for the illiterate certain colors should be adopted. In the ballot-machine colors are adopted. The Democratic list is yellow, the Republican red, the Prohibition blue. If there were other parties, other colors could be used, as white letters on a black ground, or the reverse. Colors are to help the voter, and not the machine.

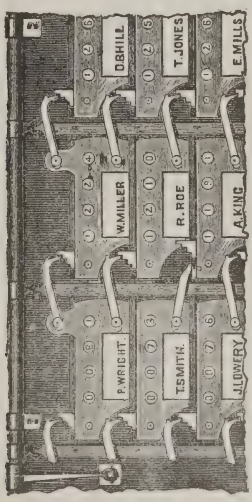
Say there are but three parties in the political contest, and some general question, as a constitutional amendment, is to be discussed with a simple "Yes" or "No." Then there

is a fourth element introduced. Having made up his mind what he intends doing, knowing the color of his party, or not knowing it, the inspector opens the door of the steel booth and the voter at once has access to the interior. When the door of entrance is closed he is entirely hidden from sight, but the door is not locked. The little room is perfectly well lighted by means of a gas-jet or lamp. The man finds a number of vertical columns with push-knobs projecting three inches from the partition. These are painted the same color as the ballot cards beside them.

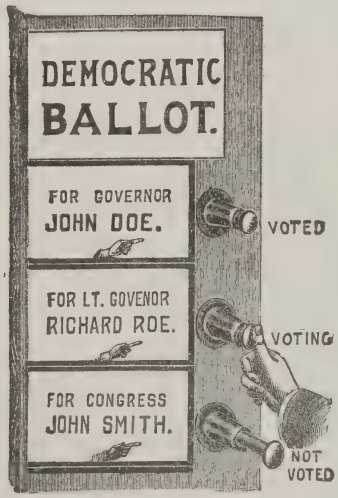
To the left of each column of knobs are the names of the candidates, printed in large legible characters, with the office they wish to fill. All the names and the knobs are in a perpendicular line, beginning, say, with a governor, and ending with a constable. This plan, if there be three or six parties in the field, brings all the candidates for the same office on the same horizontal or cross line. Each perpendicular line has on



POLLING-BOOTH.



BACK OF MACHINE.



FRONT OF MACHINE.

top "Democratic Ticket," "Republican Ticket," or "Labor Ticket." The voter may begin with the No. 1 knob, which notes, say, the Democratic governor's name. He pushes in the knob until it catches, and it remains fixed. He cannot move it out again and vote for that governor twice, or for any other governor. By that act he has done several things he does not know of. He has locked up the governors of the Republican and the Labor party. They are fixed now, and he can push all he pleases and nothing is recorded. The same result follows after voting for any one man on any cross line, it makes no matter in which column.

A voter, finding every candidate of his party to his taste, votes the whole Democratic ticket. He pushes in the 12 or more up-and-down knobs. He has accomplished

his task of coming into the booth, voting, and getting out in less than ten seconds. As has happened quite frequently, a great many honest people ignore a nominee and split their ticket, selecting a candidate from another party. Then the voter would have pushed in the Republican knob and the Democratic nominee's name would have been locked. Then he ran down the names of the other Democratic candidates, pushing in the knobs, and maybe was five seconds more in performing the duties of a free man. How is the count kept? On the reverse side of the perforated steel partition, opposite to each of the candidates' names, and in communication with a knob, is a mechanical counter which bears the same name as the knob. Before the polling begins the inspectors arrange every one of these counters or indicators at zero, and then fix to the steel door, which covers the recorders, their seal.

When the voting is over the covering is removed, and the register shows the exact number of times a knob has been pushed in, or a candidate voted for. In fifteen minutes at the outside, even when thirty or more people are to be separately voted for, with two questions, the affirmative or negative, the numbers indicated by the register can be copied. There is an additional counter, which is always visible, and shows the exact number of people who have voted. In short, this machine actually exceeds human possibility by discounting the errors of the voter and the carelessness of inspectors, and, what is more, effectually prevents fraud. The practical working of this apparatus is clearly demonstrated by actual results at regular elections. Four hundred and sixty-five *bonâ fide* votes have been polled and counted within two hours, and this year (1894) 2167 votes were polled in 9¾ hours in one polling-room.

VOTIVE (Lat. *votivus*, given in virtue of a vow; Fr. *votum*, a vow), in ecclesiastical use, signifies the class of actions, offerings, or memorial records or observances, which are intended either as the fulfillment of a vow, or as a commemoration of the accomplishment of the prayer which accompanied the vow. Of such votive engagements there are numerous examples in the Old Testament (Lev. xxii. 18, Deut. xii. 6), as well as in the ancient religions of the Gentile world; and the ecclesiastical historian Theodoret (*De Cur. Græc. Affect.*, i. 8) alludes to the practice in his own day of hanging up, in the churches dedicated to the saints, little models of hands, feet, eyes, etc., in votive commemoration of the cure of lameness, blindness, and other maladies supposed to have been obtained through their intercession. The same practice continued thoughout the succeeding centuries and throughout the mediæval period, and still prevails in Roman Catholic countries, especially in Italy and southern Germany. Votive offerings, often of very considerable value, may be seen in the churches of most of the great sanctuaries (q. v.), and in other churches in special repute as places of devotion. The offering very frequently takes the form of a votive tablet, with an inscription detailing the event on which it is founded. Sometimes the offering is simply marked with the words *ex voto*, "in fulfillment of vow;" sometimes it is accompanied by a model in wax, in wood-carving, or even in precious metals, similar to those alluded to by Theodoret; and occasionally by a model of some object, which is meant to recall the memory of the favor received, as of a ship, in case of escape from shipwreck, etc. Many of the great churches, hospitals, monasteries, and other religious monuments of the middle ages and of later times were built *ex voto;* and the treasuries of most of the rich cathedrals and other churches abroad contain objects of great value, the result of votive engagements on the part of the donors. The name *votive* is also applied in the Roman Catholic church to the mass or other service, when it is celebrated—as is permitted on certain days and in certain seasons—not according to the rite prescribed for the day itself, but according to a rite selected by the celebrant himself from a number of such "votive masses" and "votive offices," as "of the Passion," "of the Holy Trinity," "of the blessed Virgin Mary," etc., which are contained in the missal and breviary.

VOUET, Simon, 1582–1649; b. Paris, son of Laurent, a painter. He is called the founder of the French school of painting; studied with his father, and accompanied the French ambassador, baron de Sancy, to the Porte in 1611. After one interview only, he painted from memory an excellent likeness of the sultan Achmet I. Subsequently he visited Venice and Rome. At Rome he received a pension of 2,000 francs from Louis XIII. and became president of the academy of St. Luke; in 1627 principal painter to the king with apartments in the Louvre, employing Le Brun, Le Sueur, Mignard, Du Fresnoy, and others to assist him in painting ceilings, galleries, altar-pieces, small religious pieces, and portraits in oil and crayon. He is said by French historians of art to have done as much for painting as Camille did for the drama, in France. There are about 200 prints of his works, including the chapel and gallery of the Palais Royal, the altar-pieces in St. Eustache, the chapel of St. Francois de Paule, and the "Presentation in the Temple." He married the painter Virginia di Vezzo, of Velletri.

VOURLA, a town in the vilayet of Smyrna in Asia-Minor, 21 m. w.s.w. of Smyrna. It lies on the edge of a plateau and in the neighborhood are vineyards and olive groves. About 3 miles n. of it, on the gulf of Smyrna, is its roadstead, which is often visited by foreign ships of war. Pop. about 4500, the majority of whom are Mohammedans.

VOUSSOIRS, the individual stones forming an arch, and of which the central one is the keystone. They are always of a truncated wedge-form.

VOW (Fr. *vœu*, from Lat. *votum*), a promise made to God of a certain thing or action good in itself, and within the dominion and right of the person promising. The practice

of vows appears to have formed part of the religious observance of almost all races in any degree civilized; and it largely pervaded the whole ceremonial system of the Mosaic dispensation (Gen. xxviii. 20, Lev. xxvii. 2, I. Chron. [I Paralip. Vulg.] xxix. 9, II Chron. xxxi. 6, Judges xi. 30, Num. xxx. 2, Judith xvi. 19, Jon. i. 16). The stringency of the obligation of fulfilling a vow when once made, is distinctly laid down (Deut. xxiii. 21; Eccles. v. 4, 5); but it is equally clearly stated, that it is by no means a matter of obligation to make a vow (Deut. xxiii. 22). The practice of making vows continued among the Jews in the time of our Lord; and St. Paul, after his conversion to Christianity, continued to conform to this usage (Acts xviii. 18). It would be out of place to enter here into the question, whether this observance was meant by our Lord to form part of his new dispensation, or to discuss how far the practice of vows, especially of chastity, can be traced as in use among the Christians of the 1st and 2d c.; but it appears quite clear that in the end of the 3d, and all through the 4th, the monastic life became general in the east, and soon afterward spread all over the church. See Antony, Paul, Monachism. It is unnecessary to add, that vows, while discarded as a religious observance by the Reformers, enter largely into the system of the Roman Catholic church. The objects of these engagements among Catholics are very various; but they are drawn, for the most part, from what are called the evangelical "counsels," in contradistinction to "precepts" or "commands"—the most ordinary subject of vows being the so-called "evangelical" virtues of poverty, chastity, and obedience. Pilgrimages, however, acts of abstinence, or other self-mortifications, whether of the body or of the will, special prayers or religious exercises, are frequently made the object of vows; and there is another large class of more material objects, as the building of churches, monasteries, hospitals, and other works of public interest or utility, to which mediæval Europe was indebted for many of its most magnificent memorials of piety and of art. Vows in the Roman church law are either "simple" or "solemn." The principal difference between them consists in the legal effects of the "solemn" vow, which, where the subject of such vow is chastity, renders not merely unlawful, but null and void, a marriage subsequently contracted. A "simple" vow of chastity makes it unlawful to marry, but, except in the Jesuit society, does not invalidate a marriage, if subsequently contracted. Catholics acknowledge in the church a power of dispensing in vows; but this is held to be rather declaratory than remissory, and it is not acknowledged in the case of vows which involve any right of a third party. Bishops are held to possess the power of dispensing in simple vows generally; but the power of dispensing in solemn vows and in certain simple vows, as, for example, that of absolute and perpetual chastity, and of the greater pilgrimages, is reserved to the pope. The practical operation of the canon law regarding vows has evidently been much modified, even in Catholic countries, since the French revolution, and the subsequent political changes; but this must be understood to regard chiefly their external and purely juridcial effects. So far as concerns their spiritual obligation, the modern Roman theology recognizes little if any change.

VOWEL. See Letters.

VOX POPULI, VOX DEI. "The voice of the people is the voice of God." A phrase from the Latin, of which the origin is unknown. Sir Wm. Hamilton tried, but without success, to trace the proverb back to Hesiod. Lieber referred it to the election of the bishops by the people in the Middle Ages. William of Malmesbury used it about the year 920 A.D., with regard to St. Odo. The Archbishop of Canterbury took it for a text at the coronation of Edward III. in 1327. It is number 97 in a volume entitled, *Aphorismi Politici ex-Ph. Comenæo, per Lambertum Danarum collecti*, 1609.

VOYSEY, Charles, b. London, 1828; graduated, Oxford, 1851; curate of Hessle, 1852–59; of Craigton, 1860–61; of St. Mark's, Whitechapel, London, 1861; ejected on account of a sermon against endless punishment; vicar of Healaugh, Yorkshire, 1864. In 1865 he published in the *Sling and the Stone*, sermons preached at Healaugh on the atonement, justification, incarnation, and inspiration, which were deemed at variance with the Bible and the 39 articles. The secretary of the archbishop prosecuted him in the chancery court of York minster. From the sentence of condemnation he appealed to the judicial court of privy council, which confirmed the sentence, deprived him of his living, and required him to pay the costs. He afterward preached and lectured in St. George's hall, London, a fund having been raised by men of wealth called the "Voysey establishment fund." His discourses are printed weekly.

VRIHASPATI, or, as the word is written in Vedic works, Brihaspati (from *br'ih*, probably hymn, prayer, and *pati*, protector, lord), is, in Vedic mythology, the guardian of the hymns or prayers addressed by the pious to the gods, and he is therefore considered as mainly instrumental in insuring the efficacy of the sacrifice. In consequence, he is "the first-born in the highest heaven of supreme light," because the prayers reach him first; he is "seven-faced." because his faces are the seven Vedic meters; and he is "attended by all the companies of gods," or "represents all gods," when the sacrifice is performed. Being thus the "first sharer of the offering," he is sometimes also identified with *Agni*. His function of guardian of the hymns being similar to that of a priest and spiritual teacher, he is further represented as a priest of the gods, who himself "celebrates worship;" as "the observer of truth," and as imparting "virtuous instruction." In

the epic and Purânic mythology, Vrihaspati figures especially as preceptor of the gods and R'ishis, and as such he also causes them to perform sacrifices. A new character, however, in which he appears at that period is that of regent of the planet Jupiter; and in the ceremonies performed in honor of the planets, and described in several Purân'as, a special worship is paid him in this capacity.

VR/ITRA. See INDRA.

VUILLAUME, JEAN BAPTISTE, 1798–1874; b. France; member of a family of violin makers. He entered his father's shop, and soon manifested great skill. He settled in Paris in 1818. He imitated old violins by such masters as Stradivarius and Maggini. He is said to have made 3000 violins.

VULCAN (the name is probably connected with *fulgere* and *fulgur*, and may be translated the "bright shining one") was the old Italian god of fire. The various myths in connection with Vulcan prove the great antiquity of his worship. Latterly, the character, attributes and history of the Greek Hephæstus were transferred to Vulcan, and the two thus became identified. According to Homer Hephæstus was the son of Zeus and Hera; later accounts, however, asserting that the latter gave birth to him without any co-operation on the part of her husband. He appears to have been twice violently expelled from Olympus—the first occasion was shortly after his birth, when he was dropped upon the earth by his mother, who was disgusted with his sickly deformity; he was received by the marine divinities, Thetis and Euronyme, with whom he dwelt for nine years. He afterwards returned to heaven, and on interfering in a quarrel between his mother and Zeus, the latter seized him by the leg, and flung him from Olympus. After falling for a whole day, he alighted on Lemnos, where he was kindly received by the Sintians. He afterwards returned to Olympus. Homer makes him lame from his birth, while later writers attribute this defect to his second fall on Lemnos. The popular notion of Vulcan or Hephæstus appears to have been that of a burly, lame, good-natured, awkward god, often made the butt and laughing-stock of his fellows. He had a magnificent palace of his own in Olympus, "immortal, brazen, shining like stars," in which was his workshop, containing an anvil and 20 bellows, which worked at his command. Later accounts locate his workshop in the interior of some volcanic isle, such as Lemnos, Lipara, Sicily, etc., and give him as workmen the Cyclopes, Brontes, Steropes, etc. Many wonderful works of art are ascribed to Vulcan by the ancient poets, and as an artist or artificer, he appears to have been regarded as corresponding in some respects to Athene: both instructed men in the useful and ornamental arts, had the power of healing, etc., and at Athens had temples and festivals in common. In the *Iliad*, the wife of Hephæstus is Charis; while in the *Odyssey*, and in later writers, he is represented as being much tormented by the amours of his frail and charming spouse Aphrodite, with her favorite Ares (Mars). In the earlier statues, his lameness appears to have been indicated; but latterly, he was represented as a full-grown, vigorous man, with a beard. See illus., MYTHOLOGY, vol. X.

VULCAN, a supposed planet which possibly is revolving around the sun within the orbit of Mercury. About a quarter of a century ago Leverrier found certain perturbations in the motions of Mercury which indicated the existence of another body in the vicinity. Such a body could be no other than another planet. Less than three years after Leverrier's announcement Dr. Lescarbault announced that he witnessed the transit of the planet across the sun's disk. MM. Porro and Wolf of Zurich believe they saw it making a transit in 1876, but it has not been observed since. According to Kepler's law its revolution around the sun should be accomplished in about one month; and if it exists, it will probably not escape discovery many years longer.

VULCANISM, a term proposed by Humboldt to include all the evidences of internal heat, such as volcanoes, hot springs, etc.

VULCANITE AND VULCANIZED INDIA-RUBBER. See INDIA-RUBBER.

VULCANO, or VOLCANO, the southernmost island of the Lipari group, in the Mediterranean sea, 12 m. n. of the coast of Sicily. It is 7 m. long, 3 m. wide, and contains the crater of a volcano 1200 ft. high, ¼ m. in circumference and ¼ m. in depth, from which issue sulphurous gases and vapors charged with vitriol, ammonia, etc. The soil is very fertile, producing grain, fruit, and grapes. The islet of Vulcanello, lying off the n. coast, containing 2 craters, is connected with it by a neck of land.

VULGATE is the name of the Latin translation of the Bible, which is the received version in the Roman Catholic church. It must not be confounded with the older Latin translation known as the Itala (see ITALIC VERSION). While Jerome was engaged in correcting the Itala, he conceived the plan of producing a completely new version of the Old Testament, done from the Hebrew text itself. He commenced this labor about 385 A.D., and completed it in 405. He also made an improved version of the Italic New Testament, and the two together received the name vulgate. The discrepancies between the vulgate and the Itala, which had been made from the LXX., were so numerous and important, that the charge of heresy and falsification of Scripture was openly preferred against the translator by Rufinus, and even St. Augustine was doubtful for some time whether this charge might not be true. But gradually it made its way into the church, first in Gaul, then in Rome—chiefly through Gregory the Great—and finally throughout

the west. About two hundred years after Jerome's death, it became the universally received version of the church. Not long, however, did it exist in its pure and unadulterated form. Partly through the influence of the emendated Itala, partly through the manifold general causes of neglect, hastiness, and the rest, which have gone so far spoil almost every ancient MS., the text of the vulgate had become so corrupted, that in 802, Charlemagne commissioned Alcuin to revise it by old MSS. and to compare it with the original texts. This revision, however, to which afterward came other "emendations," in the 11th and 12th c. (by Lanfranc, archbishop of Canterbury, and cardinal Nicolaus respectively), completely changed the original character of the work. Nor did the "Correctoria Biblica" (i. e., certain collections of commentated and revised texts, issued at the period), do much for the improvement of the corrupted MSS. The confusion between the different codices was chiefly remarked, when the Tridentine council, in 1546, first declared the vulgate the authorized version of the Roman church, and decreed the preparation of an authenticated edition. In 1564, the papal chair undertook the task; but not before 1590 did Sixtus V. produce the work. This, however, turned out to be so utterly incorrect and faulty throughout, that the copies were speedily suppressed; and another edition, which appeared in 1592, was prepared under Clement VIII., to which in the next year, 1593, that other edition succeeded, which has since remained the normal edition of the church of Rome, and has been reprinted unchanged ever since. We may add, that the Anglo-Saxon translation of the pentateuch and Joshua, by Aelfric (10th c.), has been made from the Vulgate, and not, as has been erroneously supposed, from the septuagint; and that the vulgate has also been repeatedly translated into Arabic (the Psalms even into Persian) for the use of the Roman Catholics in the east.

VULNED, a heraldic term, applied to an animal, or part of an animal—as, for example, a human heart, wounded, and with the blood dropping from it. A pelican in her piety (see PELICAN) is sometimes described as vulning herself.

VULPIUS, CHRISTIAN AUGUST, 1762–1827, b. Germany; educated at Jena and Erlangen. He was a voluminous writer of dramas, romances, operas, etc. His *Rinaldo Rinaldini, der Räuberhauptmann*, published in 1797, was once famous, and was widely imitated.

VULTURE, *Vultur*, a Linnæan genus of rapacious birds, now forming the family *vulturidæ*, to almost all the species of which the name Vulture is popularly given. The *vulturidæ* have a longer beak than the *falconidæ*, and it is straight at the base, slightly or not at all toothed; the upper mandible longer than the lower, and hooked at the tip, the head generally bare, or covered only with a short down, which in most of the species is the case also with the neck—a ruff or collar or soft feathers surrounding the lower part of the neck, into which the upper part, and even most of the head, can be withdrawn. The legs and feet are large, but the claws are not nearly so large and strong as in the *falconidæ*, and are but slightly hooked. The middle toe is very long. The wings are long, and their expanse consequently great. Vultures have great powers of flight, and many of them soar to a very great height in the air. Their plumage has not the neat and regular appearance of that of the *falconidæ*, but it is dense, and not easily penetrated by shot. Vultures are mostly found in warm climates, and many of them are inhabitants of mountainous regions. They feed on carrion, which it seems to be their office in nature to remove from the face of the earth, that the evil consequences of its corruption may be prevented. They seldom attack a living animal, but they have been seen to sit and watch the approach of death, waiting for their feast. They are not in general courageous birds, and are often put to flight by birds much smaller than themselves; yet, if unmolested, they readily become familiar with the presence of man, and some of them seek their food even in the streets of towns, in which they are useful as scavengers They gorge themselves excessively when food is abundant, till their crop forms a great projection, and sit long in a sleepy or half-torpid state to digest their food. They do not carry food to their young in their claws, but disgorge it for them from the crop. The bareness of their head and neck adapts them for feeding on putrid flesh, by which feathers would be defiled; and they are very careful to wash and cleanse their plumage. The question has been much discussed, whether vultures discern dead animals by the eye, or are attracted to them by the smell. It is certain that they possess great powers both of smell and of vision, and the reasonable conclusion appears to be that both are of service in directing them to their prey. The rapidity with which they congregate to a carcass has been remarked with admiration, and vast numbers have often been seen assembled on a battle-field to devour the dead.

The *vulturidæ* are divided into several genera, of which one, *gypaëtos*, approaches to the *falconidæ* in its characters and habits, having the head feathered, and not always feeding on carrion, but often attacking living animals. The lämmergeier (q.v.) is one of this group. The feet are feathered to the toes, while the other vultures have the tarsi bare.

Some of the most notable species of vultures have already been described, as the condor and the Egyptian vulture. The generic name *vultur* is now restricted to those which have the head and neck without feathers and without caruncles, and a ruff of long feathers or of down at the lower part of the neck. To this genus belongs the

Tawny Vulture or Griffon (*V. fulvus*), found in the south of Europe, the north of Africa, and the west of Asia. It makes its nest on the most inaccessible rocks of high mountains, as in the Alps and Pyrenees, and sometimes in tall forest trees. It is a very large bird, more than four ft. in length. Its plumage is yellowish brown, the quills and tail-feathers blackish brown, the down of the head and neck white, the ruff white. When it has found a carcass on which to feed, it remains on the spot, gorging and torpidly resting by turns, till no morsel remains. This vulture has been seen in England, but only as an accidental visitor. The mountains and forests of the south of Europe, as well as of the north of Africa, and great part of Asia, are also inhabited by the Cinereous Vulture (*V.* or *gyps cinereus*), another large species, which departs from the typical character of the vultures in having the greater part of the neck feathered, and comparatively large and powerful claws. It does not, however, attack living animals. India, Africa, and almost all warm countries, abound in vultures of different species which it is unnecessary to describe. In the southern states of North America is found the Black Vulture (*Cathartes atratus*), there generally known as the Carrion Crow, a comparatively small species, not quite two ft. in entire length, of a deep black color, the head and neck covered with warty excrescences, and a few hair-like feathers. This bird is also very abundant in many parts of South America, where it is called the Gallinazo. Very nearly allied to it, and found in the same regions, is the Turkey Buzzard, or Red-headed Vulture (*Cathartes aura*). These vultures are more or less gregarious, not only assembling where food is to be found, but flying in flocks. They make their nests in hollow trees, and sometimes in the chimneys of deserted houses, or on the roofs of houses. In some of the towns of tropical America, they may be seen in great numbers, perched during the heat of the day on the tops of houses or on walls, asleep, with their heads under their wings. The California Vulture (*Cathartes Californianus*) is the largest rapacious bird of North America, being fully four ft. long, and about ten ft. in extent of wings. It is black, with a white band on the wings. It is found only on the western side of the Rocky Mountains. It much resembles the condor in its habits. See illus., Larks, etc., vol. VIII.

Vyâsa is the reputed arranger of the Vedas (q.v.), and the reputed author of the Mahâbhârata (q.v.), the Purân'as (q.v.), the Brahmasûtras (see Vedânta), and a Dharmas'âstra. According to tradition, he was a son of the sage *Paras'ara* and *Satyavatî*, "the truthful," who was a daughter of king Vasu, and a heavenly nymph, Adrikâ. Another tradition makes him also the father of *Dhr'itarâsht'ra*, *Pân'd'u*, and *Vidura*. On account of his dark complexion, he was called *Kr'ishn'a* (black); and, because he was born in an island (*dvîpa*) of the Yamunâ (Jumna) river, his second name was *Dvaipâyana*. That the immense bulk of literature comprised by the above-named works, and relating to different periods, cannot belong to the authorship of one and the same personage, is no matter of doubt. But the name itself of the individual to whom it is attributed conveys the meaning which must be sought for in some of the legends connected with his history. *Vyâsa* (from the Sanskrit *vi* and *as*, literally, "throw in different directions," hence "distribute") means the person who arranges a subject-matter in a diffuse manner, or the act itself of such a diffuse arrangement, and is often contrasted with *samâsa* (from *sam* and *as*, contract), the act of making a concise arrangement, or of abridging (compare the Greek *omēro-*, from *om* = *sam* = *sun*, and *ar* = *as*). Vyâsa is, therefore, a symbolical representation of the work of generations, as embodied in the Vedas, the Mahâbhârata, and the Purân'as, and of the order which gradually was brought into this literary mass. When, therefore, the Vishn'u-Purân'a speaks of 28 Vyâsas who in the reign of the present Manu arranged the Vedas, it is not impossible that some historical truth may underlie this statement, implying, as it does, a different arrangement of the Hindu scriptures at various times: and that the Mahâbhârata, and the Purân'as too, may have undergone various arrangements and recensions, until they settled down in their present form, sufficiently results from their contents. Regarding the Brahmasûtras, tradition itself seems only loosely to connect their author with the Vyâsa of the forgoing works, for it says that he was in a former life a Brâhman, *Apântaratamas*, who, after having attained final beatitude, "by special command of the deity, resumed a corporeal frame and the human shape, at the period intervening between the third and fourth ages of the present world, and was the compiler of the Vedas." (See Colebrooke's *Miscellaneous Essays*, vol. i. p. 327, Lond. 1837.)

W

W, **THE** twenty-third letter of the English alphabet, "is a letter which performs the double office of a consonant and a vowel." According to the decisive experiments of Prof. Willis (*Cambridge Phil. Trans.* iii. 231), the natural order of the vowels is *i*, *e*, *a*, *o*, *u*, or the reverse; in which the sounds must be understood to be those which prevail on the continent. The sounds, then, of *i* (that is, *ee*) and *u* (that is, *oo*) are the most remote, and the attempt to pass with rapidity from either of these to

the others, more particularly to the other extreme, gives an initial breathing which has the character of a consonant, viz., in the one case, *ee-oo*, or *you;* in the other, *oo-ee*, or *we*. See Key's *Alphabet*. This acute analysis of the articulations denoted by the characters *w* and *y* throws a clear light on the double function they perform as consonants and as vowels. The letter *w*, which originated in the middle ages, is merely one *v* joined to another, as its English name imports. It is peculiar to the English, German, and Dutch alphabets. It would appear, from a variety of phenomena in Latin and Greek, that the Latin *v* or *u*, used as a consonant, as well as the old Greek digamma (Ϝ), were more of the nature of the modern *w* than of the decidedly consonantal English *v* (see U and V). The French having, like the other Romanic nations, no character *w*, express the sound by prefixing *ou* to the vowel; as *oui* (pron. *wee*), Edouard = Edward. In the beginning of proper names they substitute *gu;* e.g., Guillaume = William. The Spaniards also use *gu*, as in the many names compounded of the Arabic *wadi;* e.g., Guadalquivir; but more frequently *hu*, as in Chihuahua (pron. *Chiwawa*). In High-German, which has become classical German, *w* is confounded with *v*, and *v* with *f;* thus, Wellington is pronounced *Vellington*. In London, *w* is substituted for *v*, and *v* for *w* with "a most amusing perversity."

WAA'GEN, Gustav Friedrich, 1794–1868 ; b. Hamburg; studied at Breslau, Dresden, Heidelberg, and Munich; was director of the royal gallery of paintings in Berlin, 1830, and of the portrait gallery of the new museum there, 1832; lectured on the history of art in Berlin, 1844. He published a pamphlet on Egyptian mummies; an essay on Hubert and Jan van Eyck; *Kunstwerke und Künstler in England und Paris; Treasures of Art in Great Britain;* and many other valuable works.

WAAL, The (Lat. *Valis* or *Vahalis*), an arm of the Rhine, thrown off near the village of Pannerden, in the Netherlands; flows thence to Nijmegen, Tiel, Nieuw-St.-Andries, between the Boemmeler and Tieler-waard, and unites with the Maas below fort Loevestein (Luvestein). The united rivers then take the name of the Merewede, which, flowing past Gorinchem and Dordrecht, becomes the Oude, or Old Maas. See Maas.

WA'BASH, a river of the United States, rises in Mercer co., western Ohio, runs w. and s.w. through Indiana, forming the southerly half of its western boundary, on the borders of Illinois, to the Ohio river, 146 m. from its mouth, is 550 m. long, and navigable by steamers at high water 300, and has for its principal branches the Tippecanoe, Big Vermilion, Embarras, and White river—the last 200 m. long.

WABASH, a co. in s.e. Illinois, having the Wabash river for its s.e. boundary; 220 sq. m.; pop. '90, 11,866. Co. seat, Mount Carmel.

WABASH, a co. in n.e. Indiana, drained by the Wabash and other rivers; 430 sq. m.; pop. '90, 27,126. Co. seat, Wabash.

WABASHA, a co. in s.e. Minnesota, bounded on the e. by the Mississippi river, where the bluffs rise 400 ft. high; intersected by the Chicago, Milwaukee, and St. Paul railroad; 540 sq. m.; pop. '90, 16,972. Co. seat, Wabasha.

WABASH COLLEGE, Crawfordsville, Indiana, a non-sectarian institution of higher education for young men only, founded in 1832. In 1897 the alumni numbered 732; the amount of invested funds was $500,000; the value of college equipment, including buildings and apparatus, was $350,000. The college grounds consist of forty acres, beautifully shaded with native forest trees. There are five large buildings devoted to educational work, substantially built of brick with stone trimmings, and containing all modern improvements. There are no dormitories. Three elective courses, classical, philosophical and scientific, lead each to the corresponding degree. The physical, chemical and biological laboratories are fully equipped with valuable apparatus. The collections of the museum are worth over $50,000. The library contains 35,000 volumes, and is adapted to *seminar* work. There are eighteen members of the faculty. President, since 1892, G. S. Burroughs, ph.d., ll.d.

WABAUN'SEE, a co. in n.e. Kansas, having the Kansas river for its n. boundary; 804 sq. m.; pop. '90, 11,720. Co. seat, Alma.

WACE, Robert, an Anglo-Norman poet of the 12th century. Many different versions of his name are given in his own books, as well as in the other books which mention him. He is styled Vace, Wace, Waece, Waice, Waicce, Waze; Gasse, Gaice, Guace, Guazi, Guaze, Guascoe, Gazoe; and again, Wistace, Huistace, Huace. It has been supposed that there were really two poets, the one named Wace or Guace, the other named Wuistace; the one the author of *Le Roman du Rou*, the other of *Le Roman du Brut*. About his Christian name there is even more doubt than about his surname. An old writer speaks of him as Matthew; and it seems that he was first called Robert in the *Origines de Caen*, by Huet, whom subsequent authors have followed.

Wace was born in Jersey, in the reign of Henry I., and it is probable that the date of his birth lay between the years 1112 and 1124. He was taken to Caen as a child, and there he received the early part of his education. He was afterward sent into the neighboring kingdom of France; but he returned to Caen, and having entered into holy orders, became a reading-clerk in the royal chapel there. At Caen it was that he composed his works. Henry II., to whom he dedicated *Le Roman du Rou*, gave him a canonry at Bayeux, apparently about the year 1160. He died in England about the year 1180, certainly before the year 1184.

Five separate works are attributed to Wace; but three are slight, short performances, and it is only necessary to notice the two principal—*Le Roman du Brut d'Angleterre* and *Le Roman du Rou*. The former premises that a certain Brutus, a son of Ascanius, and grandson of Æneas, settled in Britain, and became its first king. The book continues the history of the British kings from Brutus to Cadwallader, who died at Rome shortly before the year 700. It is little more, however, than a literal translation into the French from the Latin of Geoffry of Monmouth (q.v.). This poem seems to have been completed in the year 1155. *Le Roman du Rou* (Rollo) is a sort of history of the dukes of Normandy and of the Norman monarchy in England. Neither of these works has the slightest poetical merit. They are both interesting only as showing the state of the French language in the 12th c., and as supplying occasional facts and social traits to the historian.

WACHT AM RHEIN, Die (The Watch on the Rhine), German Volkslied, words by Max Schneckenburger (1819–1849), music by Carl Wilhelm (1820–1873). The song was written in 1840 when the left bank of the Rhine was threatened by France. The music, which is a part-song for men's voices, was composed and first sung in 1854. During the Franco-Prussian war of 1870–'1, the Emperor gave Wilhelm an annual pension. A monument was erected to his memory in his native town of Schmalkalden. A national monument was designed on the Wacht am Rhein, Johannes Schilling, and unveiled in 1883 by the Emperor, near Bingen. An overture, *Die Wacht am Rhein,* was composed by August Klughart. See Grove's *Dictionary of Music and Musicians;* and *Notes and Queries,* Fourth Series, VI.

WACHUSETT MOUNTAIN, in Princeton, Worcester co., Mass., 16 m. n. of Worcester, 8 m. s.w. of Fitchburg, is 2018 ft. high. From its summit is to be had one of the finest views in New England, including parts of six states. Hotels and boarding-houses have been built near it in the last few years, and it has become a summer resort.

WACKE, a German miners' term, introduced by Werner, to designate a soft variety of trap, that has an argillaceous aspect and a greenish-gray color. It resembles indurated clay, but has been formed of volcanic ashes or mud. It is often vesicular, and when the cavities are filled, it becomes an amygdaloid. It is associated with trappean rocks, and, indeed, often passes into basalt or greenstone.

WACO, city and co. seat of McLennan co., Tex.; at the confluence of the Brazos and Bosque rivers, and on the Missouri, Kansas, and Texas, the St. Louis Southwestern, the San Antonio and Aransas Pass, the Texas Central, and the Waco and Northwestern railroads; 95 miles n.n.e. of Austin. It is the seat of Baylor university (Bapt.), Paul Quinn college (A. M. E.), and Add-Rau Christian university (Disciples), and has a female college, business colleges, college and other libraries, city hospital, electric light and street railroad plants, waterworks supplied from artesian wells, national and state banks, and numerous daily, weekly, and monthly periodicals. The industrial plants include woolen and cotton seed oil mills, cotton compresses, and broom and mattress factories. Pop. '90, 14,445.

WAD, in gunnery, a compressible disk forced home in the barrel after the powder, to confine the latter to the least possible space before its explosion. For great guns, the wad is commonly made of rope; for small-arms, of pasteboard.

WADAY, a Mohammedan kingdom of central Africa s. of the Great Desert, and w. of Darfoor. It is called also Dar Saleyh and Borgoo. The population is between 2,000,000 and 4,000,000. It is generally level, though there are many isolated mountains. From the highland on the e. two streams flow through its valleys; uniting to form the Bahr-el-Gazal, which periodically changes the plain of Fittré into a lake; and the Bahr-Iro, another river, flows n.w. through Waday, from the mountains of Marrah. A desert tract on the e. separates Waday from Darfoor; and on the n. is the mountainous and rocky desert of the Tibboos. The s. portion is better watered and more fertile than the northern. Rice, maize, and other grains, as well as all tropical fruits, are raised.

WADDELL', James, d.d., 1739–1805; b. Ireland; brought in infancy by his parents to Pennsylvania; educated at the classical school of the Rev. Dr. Finley, Nottingham, Md.; became his assistant; taught at Pequea, Penn.; relinquished the study of medicine, and by advice of Rev. Samuel Davies, studied theology; licensed by the presbytery of Hanover, 1761; pastor of churches at Lancaster and Northumberland; removed, 1785, to an estate which he called Hopewell, preaching in various churches for 20 years. Soon after his last removal he became totally blind. His remarkable eloquence is described by William Wirt in the *British Spy.*

WAD'DELL, James Iredell, b. N. C., 1824; entered the navy as midshipman, 1841; lieut., 1855. In 1860 he was on the China station, and successfully conducted an expedition into the interior. In 1861 he resigned his commission and became a lieut. in the confederate navy. He was engaged in the Drury's Bluff action, where the union fleet was repulsed; in 1863 was sent to Europe on "special service;" and in Oct., 1864, took command of the noted cruiser, the *Shenandoah,* which was built at Glasgow; sold to a confederate agent by Liverpool owners, and handed over to Waddell near the Madeira islands. From Melbourne the *Shenandoah* started on a cruise lasting 13 months, in which she captured 38 vessels, and of these destroyed all but six. The cruise lasted until August, 1865, long after the surrender of Lee, and in November

of the same year the steamer was turned over to the British government. Capt. Waddell spent some time in European travel, and on his return to this country entered the Pacific Mail company's service. He d. 1886.

WADDELL, Moses, D.D., 1770–1840; b. N. C., graduated Hampton-Sidney college, Va., 1791; ordained a Presbyterian minister, 1792; established a classical boarding-school at Willington, S. C.; president of the university of Georgia, 1819–29. He was an eloquent preacher and an eminent instructor.

WADDING, Luke, 1588–1657; b. Ireland; studied at the Jesuit college, Lisbon; joined the Franciscans, 1605; ordained and taught theology at the university of Salamanca; accompanied as chaplain the bishop of Cartagena to Rome, 1618, sent to settle the controversy concerning the immaculate conception—an account of which embassy he wrote in a folio volume; founded at Rome the college of St. Isidore, 1625; was procurator of Franciscans at Rome, 1630–34; vice-commissioner of the order 1645–48; was one of the papal councilors to settle the Jansenist controversy. He published *Annales Ordinis Minorum; Scriptores Ordinis Minorum.*

WADDINGTON, William Henry, b. France, 1826, of English parentage; graduated at Cambridge, 1849; became a naturalized citizen of France, and made archæological explorations in Asia Minor in 1850 and 1862, the results of which are described in several books. In 1871 he was elected to the national assembly, supported Thiers, and by him was made minister of public instruction, 1873. He resigned with Thiers and voted with the left-center, or moderate republicans. In 1876 he was elected senator for the department of the Aisne, was again minister of public instruction in the Jules Simon cabinet, and in 1877 became minister of foreign affairs in the Dufaure cabinet; in 1878 was the representative of France at the Berlin conference. He was president of the council, Feb.–Dec., 1879; and ambassador to Great Britain in 1883–93. He d. in 1894.

WADE, Benjamin Franklin, 1800–78; b. West Springfield, Mass., removed to Ohio, 1821; studied law; admitted to the bar, 1828; elected prosecuting attorney of Ashtabula co., 1835; state senator, 1837, and twice re-elected; chosen presiding judge of the third judicial district of the state, 1847; U. S. senator, 1851; re-elected 1857 and 1863. He was a strong opponent of slavery; voted for the repeal of the fugitive slave law, 1852; opposed the Nebraska-Kansas bill of 1854, and the purchase of Cuba. After the election of Mr. Lincoln, 1860, he opposed all compromise between the north and the south; was appointed chairman of the committee on the conduct of the war, and advocated a more vigorous policy, urging a law to confiscate the property of the leading secessionists and emancipate the slaves; reported in 1862, as chairman of the territorial committee, a bill to abolish slavery in all the territories, and prohibit it in all future territories; was elected president of the senate, 1867; was sent, 1871, as one of the commission to San Domingo to report in relation to its annexation to the United States.

WADE'NA, a co. in central Minnesota, consisting of fertile prairies drained by numerous rivers; 540 sq.m.; pop. '90, 4053. Co. seat, Wadena.

WADERS, or Wading-birds, a designation often applied to the whole order of birds *grallæ* (q.v.), or *grallatores,* but really appropriate only to some of them, the more aquatic in their habits, as herons, snipes, and rails.

WADHAM COLLEGE, Oxford. In the year 1610, James I. issued a license to Dorothy Wadham, acting as executrix of the will of her deceased husband, Nicholas Wadham, esq., to found a "college of divinity, civil and canon law, physic, good arts and sciences, and the tongues." Dorothy Wadham purchased the site and ruins of the priory of the Austin friars, in the suburbs of Oxford, and built the present college for a warden, 15 fellows, 15 scholars, and 2 chaplains. The fellows were formerly elected from the scholars, and the tenure of the fellowships was limited to 22 years; nine of the scholarships were limited to certain counties, and to the founder's kin. By the commissioners under 17 and 18 Vict. c. 81, the fellowships and scholarships were thrown open—the former to all persons who had passed the examinations for a B.A. degree; the latter to all persons under 20 years of age. The commissioners also abolished the limitations on the tenure of the fellowships. At present, the number of fellowships is fourteen, one of them having been appropriated to the professor of experimental philosophy. The scholarships are worth £80 a year, besides rooms, and are tenable for five years.

WADHAMS, Edgar P., b. at Lewis, N. Y., 1817. He graduated in 1838 at Middlebury, Vt.; entered the priesthood of the Protestant Episcopal church, but in 1850 entered that of the Roman Catholic church. In 1872 he was consecrated bishop of Ogdensburg, N. Y. He d. in 1891.

WA'DI, an Arabic word signifying a river, a river-course, a ravine, or valley. It is supposed that the Greek *oasis* is a corruption of *wadi.* It is of frequent occurrence in the names of places; e.g., Wadi-Musa (i.e., the valley of Moses) in Arabia. In Spain, where most of the rivers bear names given them by the Arabs, *wad* has been transformed into *guad;* e.g., Wadi-l-abyadh (the white river) has become Guadalaviar.

WADLEIGH, Bainbridge, b. Bradford, N. H., 1831; received an academical education; was admitted to the bar, 1850; was a member of the state legislature, 1855–56, 1859–60, 1869–72; was elected U. S. senator, as a repub., serving, 1873–79. He d. 1891.

WADSWORTH, BENJAMIN, D.D., 1669–1737; b. Mass.; graduated at Harvard college, 1690; was associate pastor, with Mr. Foxcroft, of the First church, Boston, 1696–1725; elected president of Harvard college, 1725. He published sermons and theological treatises.

WADSWORTH, JAMES, 1730–1817; b. Conn.; graduated at Yale college in 1748. He was town clerk of Durham, Conn., 1756–86; became a brig.gen. in the continental army in 1776; was a member of the Conn. committee of safety, and had charge of the defense of the Connecticut sea-coast in 1777. In 1777 he was appointed maj.gen. in the Conn. militia. He was afterward judge of the New Haven county court of common pleas, and a member of congress, 1783–86.

WADSWORTH, JAMES, 1768–1844; b. N. Y.; graduated at Yale college, 1787; purchased with his brother a large tract of land in the Genesee valley, 1790; became one of the wealthiest land owners in the state; was much interested in education, and at his own expense printed and circulated pamphlets, employed lecturers, and offered premiums to the towns which established school libraries; advocated as early as 1811 the formation of normal schools, and was instrumental in founding the state normal school; founded and endowed an institution and library at Geneseo for scientific lectures. In the sale of his lands he stipulated that two tracts of 125 acres each in every township should be free for a church and a school.

WADSWORTH, JAMES SAMUEL, 1807–64; b. N. Y.; studied at Hamilton and Harvard colleges; having studied law, he assumed the care of the family estates; was made brig.gen. of volunteers in 1861, and military governor of Washington city, 1862; participated in the battle of Fredericksburg; at Gettysburg his division was the first to engage the enemy, and through the day lost 2,400 out of 4,000 men; during the second and third days' fight maintained the heights on the left of the line. In the Richmond campaign of 1864 his division crossed the Rapidan May 5, and in the evening suffered severely in a conflict of several hours. On the following day he was struck in the head with a bullet and died Sunday, May 8.

WADSWORTH, PELEG, 1748–1829; b. Mass; educated at Harvard, and went into business. Entering the continental army as capt. of a company of minute-men, he was aid-de-camp to Gen. Ward, adjt.gen. of Massachusetts, and in 1777 appointed brig.gen. He was captured on the Penobscot expedition, where he was second in command. Settling in Maine in 1784, he was a state senator in 1792, and member of congress, 1793–1806. The government granted him a large tract of land for his services.

WAFER, in relation to the Roman Catholic usage of the eucharistic communion, is the name given (chiefly by non-Catholics) to the thin circular portions of unleavened bread which are used in the Roman church in the celebration and administration of the Eucharist. In ancient times the bread and wine for the Eucharist were contributed by the faithful; and a place is found in the eucharistic service of every known liturgy for this offering, still known by the name of offertory (q.v.). But in the Latin church, for many centuries, the bread (which, as being unleavened, and different from that in common use, needed special preparation) has been provided by the clergy; and the practice has been followed of preparing it in the form of thin cakes, commonly, although not necessarily circular, and frequently impressed with sacred representations or emblems, as the crucifixion, the lamb, the Christian monogram, the cross, and other sacred symbols. The circular form itself is by some ritualistic writers regarded as symbolical, the circle being a figure of perfection. The wafers used in the Roman Catholic church are made of different sizes, the smallest about an inch in diameter for the communion of the people, a second considerably larger for the celebration of the mass, and a third still larger to be placed in the monstrance (q.v.) for the service of benediction or exposition. See LORD'S SUPPER.

WAFERS, thin disks of dried paste, mostly colored, used for sealing letters, or for attaching papers together. They are made by mixing fine wheaten flour with water and any non-poisonous coloring materials, so as to form a mixture not thicker than thin cream. A small quantity of this is poured on the lower limb of a pair of wafer-irons, which are formed like a pair of pincers, but with flat blades about 12 in. long by 9 in breadth, the inner surface of which is kept well polished. Before being used they are heated over a charcoal or coke fire, and the liquid paste being poured on the lower blade, the pressure of the two blades distributes it equally in a thin sheet between them, the superfluous material being squeezed out at the sides, from which it is shaved off by means of a knife. In a few seconds of time, if the blades are hot enough, the sheet of paste becomes dry and half baked. The sheets so formed are then stamped out into disks of the sizes required. Formerly, wafers were very extensively used, and their manufacture was one of considerable importance; but the introduction of gummed envelopes has almost driven them out of use.

WA'GENINGEN, an old but well-built t. in the Netherlands, province of Gelderland, is situated near the Rhine, to which access is had from it by a canal. Pop. 8000.

WAGER-POLICY, in insurance, is a policy in which the insured has no insurable interest. Such insurance contract is void in law as contrary to public policy.

WAGERS, in the United States, have generally been held void if immoral, indecent, tending to restrain marriage, or (as given in a Pennsylvania decision) if relating to the

age, height, weight, wealth, situation, or circumstances, of any person; also, any likely to interfere with the exercise of the elective franchise. Many states have statutes making all wagers null and void, and in others an elector is disqualified either by statute or by constitutional provision from casting his vote at an election in regard to which he has made a wager. Even when legal, the stakeholder's authority may be rescinded by either party before the event, and the money recovered by trover or assumpsit actions.

WAGES, in a general sense, are the compensation for labor, in a more restricted sense they are the compensation for labor carried on under the direction of another. It is in this latter sense that political economy uses the term, profits being the remuneration which a man receives when working for himself, that is, not under the direction of an employer, while wages always imply the existence of an employer. It is a general feature of wages that they are paid at short intervals, as being necessary for immediate support, and the term proletariat is often applied to those who receive this sort of remuneration, that is, who live during a given week on the proceeds of that week's labor.

Wages, in the modern sense of the word, were not present in the middle ages. Under the feudal régime, protection by his lord and certain privileges on the land which he worked were the only remuneration of the laborer, except in the case of those artisans who took refuge in cities and laid the foundation of the burgher or middle class. Even there the remuneration of the workman was in no wise subject to the present law of wages, for his pay was under the complete control of the guild to which he belonged, and not affected by competition to any such extent as wages are at present. So long as the guild system lasted, the wages problem in its present form did not exist, and even after the guild system was abolished, governments paid a strict attention to the laboring class, regulating what price he must ask for his services, where he must live, and under what conditions he might change his residence. Just as the economic policy of the times (see POLITICAL ECONOMY) fettered trade, so it imposed every imaginable restraint on labor, without regard to that principle maintained by later economists that labor, if left to itself, would naturally seek its most productive channel. It took the forcible arguments of Adam Smith to convince statesmen that restraint of labor, like restraint of trade, checked economic advancement.

After Adam Smith came the so-called orthodox school of economists, with their firm belief in the efficacy of natural law and in the desirability of absolute freedom of contract between masters and men. They opposed everything which tended to impede the free play of natural laws. Out of their reasonings grew the doctrine of the wages fund. The chief points of this are, that there is a certain fund set apart by economic forces for the payment of labor. During a certain period of time no power on earth can change this fund. If the share of the wage earner exceeds it, it must be at the expense either of the share of the capitalist, or of the share of the landlord. Yet the share of the capitalist at any given time is just enough to turn the requisite amount of wealth into capital, and the share of the landowner is just enough to keep the requisite amount of land under cultivation. If there is a falling-off in either, it must be because either one or the other of these factors of production have had to forego their just due, and the result must be, in such an event, the impairment of productive power to the detriment of the laborer as well as to that of society as a whole. The only means by which the individual laborer can secure a larger share of this wages fund, is by maintaining a higher standard of life, and refusing to increase his numbers beyond a certain point, that is, beyond a point at which his share of the fund is sufficient to supply his needs according to that standard. Yet the same writers who taught this doctrine of the wages fund, showed that there is always a tendency for the number of laborers to increase up to the limit of bare subsistence. The outlook for the wage earner on these assumptions was gloomy, and the socialistic writers arrived, by the logic of the old school of economists, at the conclusion that free competition was a failure, and that a radical reorganization of society was necessary. The economists accordingly began to reconsider their premises. An Englishman named Thornton exposed the fallacy of the wages fund doctrine, and John Stuart Mill, who had been one of its ablest advocates, publicly recanted.

The wages fund theory is not generally held at present. The objection to it is that there is no ground for assuming the existence of a fixed fund. Wages may be paid out of product. A recent writer goes so far as to say that wages are the discounted value of the product. Of course it usually happens in a business that an employer has a certain amount at any given time intended for the payment of his workmen, but there is no reason for considering this sum fixed, because as fast as it is diminished, the value of the work done by his laborers can be made to replenish it. So far from being a fixed fund, it varies always from day to day, since at the end of each day the employer is richer to the extent of the value which the labor of his workmen has added to the materials upon which it is engaged.

This view of wages as coming in reality out of the product of industry, has made an important change in the economic theory of the relations between labor and capital. If the laborer is paid according to the value he creates, it is obvious that his share may be increased without trenching upon the share of the capitalist or of the employer. Some economists hold that the principles which underlie the rent of land (see RENT) also underlie the remuneration of labor, on the assumption of perfect competition, that is to say, just as the rent of land arises from differences in fertility and situation, so compensation of labor springs from differences in industrial efficiency or in advantage. As one piece of land

of superior fertility yields a surplus as compared with a piece of land of inferior grade, so labor of the more capable or industrious workman yields a greater return than that of a less efficient laborer. The importance of this is that, theoretically, under a system of perfect competition, it is conceivable that the share of the wage earner may be obtained without subtracting from the shares of the other factors of production. The view of the socialists is that the wages system is merely transitional, and that just as slavery and serfdom have passed away, it too will pass away through the process of evolution, although human efforts can aid in bringing this about. As a rule, the socialists attach too little importance to the share of business ability and skill in management as factors of production, holding that labor is entitled to the product of industry without regard to the claims of the other elements in production.

To pass from the theoretical to the practical side of the wages question, the historical fact is that for the first three hundred years of the period during which the modern system of free competition has existed, wages tended to decline, but during the succeeding sixty years, i. e., from about 1840 to the present time, they have increased. The fact of this increase during the last sixty years is generally admitted. The opponents of the system of free competition say that the increase is nominal and not real, that it is wholly due to the depreciation in the value of money. It is true that the value of the precious metals has declined, especially since the discovery of gold in California, in 1850, but the decline has not been sufficient to offset the increase in wages, and, while double the amount of money will not purchase double the amount of goods that it would purchase sixty years ago, it will still buy nearly two-thirds more, so the general conclusion is that wages have increased not only nominally but really. It seems strange, at first thought, that during the very period in which competition has been keenest and in which capital has gained the advantage of greater concentration, the condition of the laborer should have improved. This is explained by the fact that in the earlier period, while capital was in the control of more persons, and therefore subject to more competition than at present, labor was wholly unorganized. The parties in the industrial struggle, that is, the capitalist-employers on the one hand and the laborers on the other, were far more unevenly matched at the beginning of the nineteenth century than they are at its close. The advantage was greatly on the side of the capitalist, and the result was a more unfair distribution of wealth than at present, for now labor too is organized, and instead of a miscellaneous crowd of individuals competing for employment, we have unions and federations of labor enforcing their demands by strikes and boycotts. In other words, organized labor is pitted against organized capital. The consequences of the contest are more serious to the community than before, and for this reason the motive for amicable adjustment is greater.

As to the movement of wages in the United States in the past two hundred years, the figures show that the wage rate has steadily increased. Carroll D. Wright finds that at the close of the colonial period, agricultural laborers received 40 cents a day, butchers $33\frac{1}{3}$ cents, carpenters 52 cents, shoemakers 73 cents, and boat-builders 90 cents. It is hard to estimate the purchasing power of money at that time, but it would seem that while meats, dairy products and house rent have increased in the United States as well as in Europe, other commodities have decreased in as great proportion. Manufactured goods have, of course, cheapened considerably and there has been a cheapening along such lines as may be classed under the head of transportation, intercommunication and education. The estimates of the comparative purchasing power of wages are very diverse. In the United States they seem to show that a dollar will purchase more now than it would one hundred years ago, while in Europe it is probable that the present purchasing power of money is less than at the beginning of the nineteenth century. One of the best estimates of comparative wages in the United States was made by the Senate Committee on Finance in its report on *Wholesale Prices, Wages and Transportation*, in 1891. In order to indicate the general course of wages, they compared those paid in twenty-two industries, including about one hundred establishments, in 1860, with those paid in the same industries in 1840 and in 1891 respectively. Placing the average paid in 1860 at 100%, they found that wages in 1840 stood at $87\frac{7}{10}$ and wages in 1891 stood at $160\frac{7}{10}$, that is to say, that wages had increased 73% as compared with 1840, and 61% as compared with 1860.

While this increase has been general in all civilized countries, the fact remains that the increase of the other factors in production has been more than proportional. It is the complaint of the socialists that the wage earner has been forced to see others gaining more than their proportion and that this excess must have been taken from his share. The French economist Gide estimates that the total of all private fortunes in France has trebled in fifty years and more than doubled in thirty years, while the most optimistic estimates of the laborers' share do not exceed 100% and most of them are not above 66%.

The practical questions connected with the study of wages are so numerous that it is impossible to deal with them within the limits of this article. Among the most important of these questions are the extent of unemployment and the means adopted for its relief, the effect of trade unions, the utility of the various forms of co-operation, the future of unskilled labor, the effects of strikes, the increase in the number of female employees, and the relation of production to productive capacity. For much valuable information on these and kindred topics relating to recent conditions in the United States the reader is referred to the publications of the United States Department of

Labor and of the Bureaus of Labor of the several states. The following table, from the Bulletin of the Department of Labor of May, 1897, gives some interesting statistics of the number of wage-earners in the United States, its increase from 1870 to 1890, and the comparative number of male and female laborers:

NUMBER OF MALES AND FEMALES 10 YEARS OF AGE OR OVER IN THE UNITED STATES AT THE CENSUSES OF 1870, 1880, AND 1890, BY CLASSES OF OCCUPATIONS.

CLASSES OF OCCUPATIONS.	1870.		1880.		1890.	
	Males.	Females.	Males.	Females.	Males.	Females.
Agriculture, fisheries, and mining	5,744,314	397,049	7,409,970	594,654	8,333,813	679,523
Professional service	278,841	92,257	425,947	177,255	632,646	311,687
Domestic and personal service	1,338,663	973,157	2,321,937	1,181,506	2,692,879	1,667,698
Trade and transportation	1,209,571	19,828	1,803,629	62,852	3,097,701	228,421
Manufacturing and mechanical industries	2,098,246	353,997	2,783,459	630,890	4,064,051	1,027,242
All occupations	10,669,635	1,836,288	14,744,942	2,647,157	18,821,090	3,914,571

WAGNER, ADOLF, b. 1835, German economist, one of the ablest of the so-called historical school of political economists (see POLITICAL ECONOMY), was educated at Göttingen and Heidelberg, became professor of statistical science at Dorpat in 1865, of political science at Freiburg in 1868, and at Berlin in 1870. After publishing several works on monetary and financial topics, he undertook, in collaboration with other economists, an exhaustive and lengthy treatise on political economy, of which the first volume (*Grundlegung*) appeared in 1876, and the seventh volume (*Finanzwissenschaft*, Part III.) in 1889. He had already discussed social theories and the claims of socialists in his well known work *Ueber die Socialen Frage* (1872), and in the longer treatise includes a careful critical study of scientific socialism, especially as expounded by Rodbertus and Marx. In this he showed himself favorable to an enlargement of state functions, supporting vigorously, for instance, state control of railways and insurance, and ranged himself with the so-called *Kathedersocialisten*, or "socialists of the chair." His position on these questions involved him in controversy, and a record of one of these economic tilts is given in *Mein Konflikt mit dem Freiherrn von Stumm*, which he published in 1895. Among other later writings of his are *Die Neueste Silberkrisis und Unser Münzwesen* (1893), and several articles in Schönberg's *Handbuch der Polit. Oekonomie.*

WAGNER, CHARLES, a French writer, born January 3, 1852. At the age of 14 he was sent to Paris, and afterward studied theology at the University of Strasburg and at Göttingen. He has had parishes in Protestant missions in various parts of France and has lived in Paris since 1882. He has published *Youth* (1893) and *Courage* (1894), both of which works have been translated into English; and *La Vie Simple.* These books are a protest against the decadent spirit of modern France, and are marked by a high moral and spiritual tone.

WAGNER, RICHARD, the greatest of modern composers, b. in Leipsic, May 22, 1813; d. in Venice, Feb. 13, 1883. His ancestors were natives of Saxony, of respectable position, and his father, Carl Friedrich Wilhelm Wagner, was clerk of the police court in Dresden, and a passionate lover of the theatre. He died when Wagner was a few months old, and his mother was married two years later to Ludwig Geyer, dramatic author and actor, who settled in Dresden and entered Wagner in the Kreuzschule under the name of Geyer. Geyer wished to make a painter of him, but Wagner's first passion was for poetry, and at the age of thirteen he translated the first twelve books of the Odyssey out of school hours, and wrote several tragedies. In 1827 he entered the Nicolaischule, but, angry at being placed in the third class, shirked his studies and spent his time in writing dramatic poetry. His attention was first attracted seriously to music by hearing Beethoven's symphonies at the Gewandhaus, and he tried to study harmony alone. Gottlied Müller taught him music, and under his guidance Wagner wrote a quartet, a sonata, and an aria, but Müller considered him willful, and Wagner thought him a pedant. In 1829 he went to the Thomasschule in Leipsic, but studied in a desultory way, and an overture was performed and failed. In 1830 he entered the University of Leipsic as a student of philology and æsthetics, but neglected these for a course of composition under Theodor Weinlig. A symphony in C was given at the Gewandhaus, Leipsic in 1833, in which year his career begins. He was engaged as chorus-master at the Stadttheater in Würzburg, where his elder brother Albert was actor and stage-manager. Here he wrote his first opera, *Die Feen*, after Gozzi's *La donna serpente*, but this work was not represented until 1888. In 1834 he went to Magdeburg, as music-director of the Stadttheater, where he wrote his *Das Liebesverbot* on Shakspeare's *Measure for Measure*, which was disastrous. In 1834 he married the actress Wilhelmine Planer and followed her to Königsberg, where he became engaged at the theatre, remaining until 1837, when he went to Riga in the same capacity. Here he wrote the text and part of the music of *Rienzi*. In 1839 he set sail for Paris by way of London, and while on the voyage conceived the idea of the *Flying Dutchman* (*Der fliegende Holländer*). Arriving in Paris, he worked hard to get his operas, *Das Liebesverbot* and *Rienzi*, accepted at the Académie Royale de Musique, but was unsuccessful, and after three years of poverty and disappointment, he went to Dresden, where Rienzi was represented in 1842 with such success that Wagner was made Hofkapellmeister with Reissiger. *Der*

fliegende Holländer and *Tannhäuser* followed, and *Lohengrin* was shelved owing to Wagner's participation in the revolution of 1849. Exiled by the government, he fled to Weimar to Liszt, with whom he had formed an ardent friendship, and thence to Zürich, where he wrote his most important pamphlets, *Die Kunst und die Revolution; Das Kunstwerk der Zukunft; Kunst und Klima; Oper und Drama;* and *Eine Mittheilung an meine Freunde,* besides the entire text and part of the music for the *Nibelungen Trilogy.* In 1857 he tried to gain a representation for his newly completed opera, *Tristan und Isolde,* and in 1860 went to Paris, hoping to have this, or *Tannhäuser,* or *Lohengrin,* represented in French, but was unsuccessful. He gave three concerts of excerpts from his works at the Theatre Italien, which created great excitement and controversy. Owing to the Princess Metternich, Tannhäuser was accepted at the opera, and given in 1861, but it was soon withdrawn. In this year Wagner received permission to return to any part of Germany except Saxony. *Tristan und Isolde* was accepted in Vienna, but was given up after seven rehearsals. In 1862 Wagner lived at Biebrich on the Rhine, working on *Die Meistersinger.* In 1864 he was invited by Ludwig II. to Bavaria, and given by him a villa on Lake Starnberg and a yearly stipend. In 1865 *Tristan und Isolde* was given under von Bülow's direction in Munich, and *Die Meistersinger* in 1868. From 1865 till 1871 Wagner lived at Triebschen on the Lake of Lucerne. His wife died in 1866, and in 1870 he married Liszt's daughter, Cosima, who had been divorced from Hans von Bülow.

King Ludwig planned to build a special theatre for Wagner in Munich, but the site was afterwards chosen in Bayreuth, where Wagner settled in 1872, and on his sixtieth birthday the corner-stone was laid. In August, 1876, the dream of his life was realized by the festival performance of the *Nibelungen Trilogy,* under the direction of Hans Richter. This was one of the greatest events in the history of music. No expense was spared to secure the most celebrated artists, and the orchestra was composed of distinguished musicians, including August Wilhelmj, as first violin. Performances of Wagner's music dramas have been since given annually with the exception of a few years. Wagner's last work, *Parsifal,* was brought out there in July, 1882. Afterwards Wagner went to Venice, where he died. On Feb. 13, 1883, his body was taken to Bayreuth and interred in a vault in his garden at "Wahnfried." Wagner was slightly under middle height and quick in movement, speech, and gesture.

"The fascination of his talk and his ways increased on acquaintance. When roused to speak of something that interested him he looked what he meant, and his rich voice gave a musical effect to his words. His presence in any circle apparently dwarfed his surroundings. His instinctive, irrepressible energy, self-assertion, and incessant productivity went hand in hand with simple kindness, sympathy, and extreme sensitiveness. . . . The noble and kindly man, as his friends knew him, and the aggressive critic and reformer addressing the public, were two distinct individuals. Towards the public and the world of actors, singers, musicians, his habitual attitude was one of defiance. He appeared on the point of losing his temper, showed impatience and irritation, and seemed to delight in tearing men and things to pieces. His violence often stood in the way of his being heard; indeed he has not yet been heard properly, either on questions of art so near and dear to him, or on questions further off regarding things political, social, or religious." . . .

"A list of the principal books in the extensive library at Bayreuth would give a fair idea of his literary tastes, for he kept nothing by him that was not in some way connected with his intellectual existence. The handiest shelves held Sanskrit, Greek, and Roman classics; Italian writers from Dante to Leopardi; Spanish, English, French dramatists; philosophers from Plato to Kant and Schopenhauer; a remarkably complete collection of French and German mediæval poems and stories, Norse sagas, etc., together with French and German philologists; history and fiction, old and new, were represented, and translations of Scott, Carlyle, etc."

His favorite musical works were: Beethoven's quartets, Sonatas, and Symphonies; Bach's *Wohltemperirtes Clavier;* Mozart's *Zauberflöte, Entführung aus dem Serail, Figaro,* and *Don Juan;* Weber's *Freischütz* and *Euryanthe;* and Mozart's Symphonies in E-flat, G minor, and C.

Wagner's aim has been defined as "reform of the opera from the standpoint of Beethoven's music." His argument is that in our day "each separate branch of art has reached its limit of growth, and cannot overstep them without incurring the risk of becoming incomprehensible, fantastic, absurd. At this point each art demands that it shall be joined to a sister art—poetry to music, mimetic to both; each will be ready to forego egotistical pretensions for the sake of an artistic whole, and the musical drama may become for future generations what the drama of Greece was to the Greeks." Wagner's principal critical work, *Oper und Drama,* contains a quasi-historical criticism of the opera; a survey of the spoken drama; and an attempt to construct the theory of the musical drama. His Beethoven is a study of the metaphysics of music based on Schopenhauer, and his other essays are valuable for their wide range and minute analysis. In his early years the choice of subject gave him much concern, but he finally found his field in the ancient myths, but only those who are familiar with the sources of Wagner's dramas can justly appreciate the amount of thought and work that was required to select, arrange, and weld the material together. Many of his poems are written in

alliterative verse. When the poem was finished the music was written. With the first conceptions of characters and situations, certain musical phrases had suggested themselves, and these were worked out into the *leit-motive*, which in Wagner's hands are manipulated with great skill. They are woven in and out of the orchestral score like visions, recalling the past, floating the action, accenting the detail, and clearing all mysteries like a Greek chorus. Wagner is the supreme master of instrumentation. His orchestra is fuller and richer than that of Beethoven, which is due to his elaborate treatment of the string-quartet, the frequent sub-divisions of the various groups of instruments, the use of chromatics in horns and trumpet, and the addition of many instruments unknown to Beethoven. He frequently supplements certain parts in the wood-wind and brass, with other instruments of their family, producing unique and beautiful effects. Wagner's chromatic and enharmonic progressions are often made by passing notes which have melodic significance only, but serve to bind the various *leit-motives* together. The harmonic framework of the dramas with the gigantic scheme of rhythms, harmonic combination, and *leit-motives* must be studied in order to understand the dramatic action, for the orchestra is, in fact, a huge caldron, which may be regarded as brewing all that transpires upon the stage. Nothing greater that the ride of the Walküre and the *Waldweben* in Siegfried in the way of tone-pictures has ever been written.

Wagner's works for the stage are: *Die Hochzeit*, fragment (1833); *Die Feen*, overture only performed, Magdeburg (1834); *Das Liebesverbot*, Magdeburg (1836); *Rienzi*, tragic opera, Dresden (1842); *Der fliegender Holländer* (*Flying Dutchman*), Dresden (1843); *Tannhäuser* (1845); *Lohengrin*, Weimar (1850); *Rheingold*, Munich (1869), and *Die Walküre*, Munich (1870), performed with *Siegfried* and *Die Götterdämmerung* as *Der Ring des Nibelungen*, Bayreuth (1876); *Tristan und Isolde*, Munich (1865); *Die Meistersinger von Nurnberg*, Munich (1868); and *Parsifal*, Bayreuth (1882). Orchestral music: Eight overtures, including *Eine Faust Ouverture;* Symphony in C; *Huldigungsmarsch* (1864); *Kaisermarsch* (1871); *Grosser Festmarsch*, for the Centennial, Philadelphia (1876); *An Weber's Grabe: Trauermarsch*, and double vocal quartet (1844); *Siegfried Idyll* (1870); and *Das Liebesmahl der Apostel* (1843). Choral works: *New Year's Cantata*, Magdeburg (1835). Pianoforte music: Sonata in B-flat; Polonaise in D; Fantasie in F-sharp minor; *Albumblätter* (Album) *Sonata* in E-flat; songs and arrangements for the pianoforte of Beethoven's *Ninth Symphony*, Mozart's *Don Juan*, Glück's *Iphigenie en Aulide*, Palestrina's *Stabat Mater*, Donizetti's *La Favorita*, and *Elisire d'amore* and Halévy's *La Reine de Chypre* and *Le Guittarero*. Wagner's literary works are contained in ten volumes entitled *Gesammelte Schriften* (Leipsic, 1871–85), and in *Nachgelassene Schriften und Dichtungen von R. W.* (1895). Dannreuther has translated *Music of the Future* (London, 1873); *Beethoven* (1880); and *On Conducting* (1885); and Hueffer the *Letter on Liszt's Symphonic Poems* (London, 1881). See A. Jullien, *Richard Wagner, sa vie et ses œuvres* (Paris, 1886); Glasenapp, *Richard Wagner's Leben und Wirken* (Leipsic, 1882); do., *Wagner-Lexicon* (Stuttgart, 1883); Kastner, *Wagner-Catalog, 1830–83* (1872); Oesterlein, *Katalog einer Wagner Bibliothek* (1882); Mayrsberger, *Die Harmonik Richard Wagners* (Chemnitz, 1882); R. Pohl, *Richard Wagner, ein Lebensbild* (Leipsic, 1883); do., *Richard Wagner, Studien und Kritiken* (1883); W. Tappert, *Richard Wagner, sein Leben und seine Werke* (Elberfeld, 1883); do., *Wagner-Lexicon und Wörterbuch der Unhöflichkeit* (1877); *Die Sprache in Richard Wagner's Dichtungen* (Leipsic, 1878); *Wagneriana* (ib., 1888); A. de Gasperini, *Richard Wagner* (Paris, 1866); Heuffer, *Richard Wagner and the Music of the Future* (London, 1874); Raff, *Die Wagner Frage;* Gotthold, *Ueber Richard Wagner's Tannhäuser* (Königsberg, 1854); Müller, *Tannhäuser* (Weimar and Leipsic, 1853); Eduard Schelle, *Tannhäuser in Paris* (Leipsic, 1861); Wolzogen, *Thematische Leitfaden durch Nibelungen, Tristan und Parsifal;* Müller, *Tannhäuser und Wartburg Krieg* (1853); do., *Der Ring des Nibelungen* (1862); do., *Richard Wagner und das Musik Drama* (1865); do., *Tristan und Isolde* (1865); *Lohengrin und die Meistersinger von Nürnberg* (Munich, 1869); Heuffer, *Parsifal* (London, 1884); Alfred Forman, *Nibelungen Ring* in English (London, 1877); R. Bechstein, *Tristan und Isolde* (Leipsic, 1876); Gustav Kobbé, *Wagner's Music Dramas* (New York, 1889); H. von Nolte and E. Hagen, *Tannhäuser und Lohengrin* (Berlin, 1873); *Bayreuther Blätter;* Liszt, *Gesammelte Schriften;* H. von Wolzogen, *Erinnerungen an Richard Wagner* (Vienna, 1883); do., *Richard Wagner's Lebensbericht* (Leipsic, 1874; translation in *North American Review*, 1879); do., *Poetische Lautsymbolik* (Leipsic, 1876); do., *Der Nibelungen Mythos in Sage und Literatur* (Berlin, 1876); Ehrlich, *Für den Ring der Nibelungen gegen das Festspiel in Bayreuth* (Berlin, 1876); Julius Stinde, *Meistersinger Motive* (Hamburg, 1873), and *Briefwechsel zwischen Wagner und Liszt* (Leipsic, 1887), translated by Heuffer, *Wagner-Liszt Correspondence* (New York and London, 1889).

WAGNER, Rudolf, 1805–64, German physiologist, studied medicine at Erlangen and Würzburg, and completed his education at Paris, where he studied comparative anatomy. After travelling in France, he visited Cagliari, but returned to Germany, and for a short time practiced medicine at Augsburg. He then taught in the university of Erlangen, where he became a professor in 1832. In 1840 he was called to the university of Göttingen. Among his writings are *Lehrbuch der Vergleichenden Anatomie* (1834–35), republished under the title of *Lehrbuch der Zoötomie* (1843–47); *Icones Physiologicæ* (1839–40); *Lehrbuch der Physiologie* (1839); *Handwörterbuch der Physiologie* (1842–55); and *Neurologischen Untersuchungen* (1854).

WAGON, a vehicle for the conveyance of goods or passengers, is mounted on four wheels, but varies considerably in the construction of its other parts, according to the

species of the traffic in which it is to be employed. Since the wagon has four wheels, it is quite unnecessary that any part of the weight should be sustained on the shafts, and accordingly these latter are hinged to the fore-part of the frame, so as to be raised or let down at pleasure. Most wagons are mounted on springs, on account of the weight of the vehicle, and the absence of the steadying weight of the horse, owing to the shafts not being immovably attached to the frame. For facility in turning, the fore wheels are occasionally smaller than the hind ones; and in addition, the fore axle of the lighter kinds of wagon is attached to the body of the wagon by a swivel-joint, the shafts or pole being in this case attached to the fore axle; but the diminution of the size of the wheels is open to grave objection, on account of the greater friction. It being almost impossible for the beasts of draught to control and subdue the momentum of a heavily-loaded wagon descending a slope, it is necessary to employ a drag of some sort; the rudest forms of which are a thick cylinder of tough wood inserted between two spokes of the wagon which, being carried upward in the wheel's revolution, is "jammed" against the under side of the wagon-frame, and stops the wheel's rotation; and the *chain-drag*, which was merely a chain firmly fastened at one end to the wagon-frame between a fore and a hind wheel, and furnished at the other end with a large hook, to hold the tire of the hind wheel; the method of chaining the fore and hind wheels together was also employed. But in the better class of wagons, the *shoe* and *break* (see DRAG) are now employed. Various forms of wagon in use in foreign countries are the brewer's *dray*, the railway *lorry*, the agricultural *wain* (in common use in England and on the continent), and the *bullock-cart* of s. Africa. In the U. S. the large Conestoga wagon, or "prairie schooner," covered with canvas and drawn sometimes by several yoke of oxen, figures in all stories of emigrant and pioneer life, and is still used in the far west. The "Concord wagon" is largely used for mountain travel, and the heavy Studebaker wagon, for farm work. The comparative merits of a vehicle in which the horse has merely to draw, and one, as the cart, in which he has to carry as well as draw, have often been discussed, though never sufficiently tested; but it seems to be generally believed that, despite the distress arising from his confined position in the comparatively immovable shafts of a cart, a horse can transport a greater weight to a moderate distance by the same exertion of muscular force in a cart than in a wagon.

WA'GRAM, or DEUTSCH-WAGRAM, a village of lower Austria, on the left bank of the Russbach, 19 m. n.e. from Vienna, is of little importance, except as the site of the great battle between the French and Austrians in the campaign of 1809, which forced Austria to bow before Napoleon, and submit to the onerous conditions of the fourth treaty of Vienna (q.v.). After the capture of Vienna, Napoleon resolved to pass the Danube, and complete the prostration of Austria's military strength by the destruction of her last army—that under the archduke Charles; and with this view, he called in the Italian army, under Eugene Beauharnois, and all his outlying corps, concentrating them in and about the island of Lobau; and after a few feints, calculated to mislead the archduke, who, stationed on the n. bank, was vigilantly guarding the various crossings, succeeded in effecting a most extraordinary passage, on the morning of July 5, 1809, from the island of Lobau to the n. bank, opposite Enzersdorf, landing 150,000 infantry, 30,000 cavalry, and 600 pieces of cannon before six in the morning. When the morning light showed the Austrians how they had been out-maneuvered, they retreated across the plain of the March-field to its northern extremity, and took up a formidable position at Wagram, and being closely followed up, were, on the evening of July 5, attacked by a part of the French army. By the vigorous exertions of the archduke in person, the assailants—after a temporary success—were completely repulsed, and the Austrians, exulting in their second victory over Napoleon, waited in sanguine expectation the events of the next day. In the morning, the archduke resolved to assume the offensive, and succeeded at first in defeating the French center under Massena, and in forcing their left into inextricable confusion, followed by total rout; but at the same time his own left was turned by Davoust, and this success followed up by a successful attack of Macdonald on their center, forced the Austrians to retreat, which they did in the most orderly manner, carrying with them 5,000 prisoners, and leaving 25,000 dead or wounded on the field of battle—the French loss being about equal. This drawn battle (the archduke having, as Savary says, "in reality no reason for retiring") had all the moral effects of a victory for the French; and was followed on July 11 by the armistice of Znaim, which resulted in the fourth treaty of Vienna.

WAGTAIL, *Motacilla*, a genus of birds of the family *motacillidæ*, which is now very generally regarded as a sub-family (*motacillinæ*) of *sylviadæ*, distinguished by a lengthened and slender bill, long and pointed wings, rather long and slightly curved claws, and a long narrow tail, which the bird incessantly wags up and down, with a jerking motion. The genus *motacilla* of Linnæus included many of the *sylviadæ* not belonging to this group, as the red-breast, nightingale, black-cap, and blue-bird. The genus *motacilla*, as now restricted, has a slender awl-shaped, straight bill; the nostrils oval, on the sides of the bill near the base, partly covered by a naked membrane; the wings of moderate size, the first quill-feather the longest, the second and third nearly as long as the first, the tertials very long; the tarsus much longer than the middle toe; the tail of twelve feathers, long, and nearly equal at the end.—The wagtails run with great celerity, and seek their food on the ground. Their food consists chiefly of insects and small seeds. They frequent the margins of rivers and lakes, inundated fields, and other moist

grounds. "While the cows are feeding in moist low pastures," says White (*Nat. His. of Selborne*), "broods of wagtails, white and gray, run round them, close up to their noses, and under their very bellies, availing themselves of the flies that settle on their legs, and probably finding worms and larvæ that are roused by the trampling of their feet." Wagtails make their nests on the ground, among moist herbage, or in stony places. Their flight is rapid and undulatory. They are natives of the temperate regions of the old world. No species is found in America.

WAHA'BIS, or WAHA'BITES, a recent Mohammedan sect, now dominant throughout the greater part of Arabia. The movement may be considered a puritanic reform, which seeks to purge away the innovations and corruptions introduced in the course of ages, and to bring back the doctrines and observances of Islam to the literal precepts of the Koran and of the Sunna (q.v.), or oral instructions of Mohammed himself. This purified faith the Wahabis consider it their duty to impose at the point of the sword—in this, too, following strictly the precepts and practice of Mohammed and the first caliphs. The founder of the sect, Ibn-abd-ul-Wahâb, was the son of an Arab sheik, or chief, and was born in Nejed or Nejd (the central highlands of Arabia), about the end of the 17th century. He is said to have visited various schools in the principal cities of the east, and to have lived some years in Damascus; and here he is represented as forming the resolution to restore in its primitive shape the ruined structure of Islam. Nor was the task an easy one. Throughout the Mohammedan world, the precepts of the Koran had fallen into abeyance, more especially among the Turks; and religion was little else than a round of external ceremonies—prayers, ablutions, fastings, the worshiping of the holy sheiks or saints at their tombs, and other superstitious innovations. In central and eastern Arabia where the faith of Mohammed had never taken deep root, matters were even worse. According to Palgrave, "almost every trace of Islam had long since vanished from Nejed, where the worship of the Djann (genii), under the spreading foliage of large trees, or in the cavernous recesses of Djebel Toweyk, along with the invocation of the dead and sacrifices at their tombs, was blended with remnants of old Sabæan superstition, not without positive traces of the doctrines of Moseylemah and Kermut. The Koran was unread, the five daily prayers forgotten, and no one cared where Mecca lay, east or west, north or south; tithes, ablutions, and pilgrimages were things unheard of." Central Arabia was at that time divided among a multitude of virtually independent chiefs. One of these chiefs, named Sa'u'd (or Saoo'd), a young man of ardent and capacious mind, who ruled over the small territory around the stronghold of Deraijeh, or Dureeyeh* (in Nejed), was the first important convert made by Ibn-abd-ul-Wahab after his return home; and the example of the prince was followed by his kindred and retinue. The Wahabi is said to have promised Sa'ud that if he would draw the sword in the cause of pure Islam, he would make him sole ruler of Nejed, and the first potentate in Arabia. The prophecy was fulfilled, partly in Sa'ud's reign, and fully in that of his son; and the Sa'ud dynasty is at this day the chief power in the peninsula, while the decendants of Ibn-abd-ul-Wahab (who lived till 1787) continue to act as spiritual directors, though without any acknowledged authority. It was about 1746 that Sa'ud began to act as apostle militant of the new, or rather revived Islam. One after another he subdued his heretical neighbors, offering them the alternative of conversion or extermination. Dying in 1765, he was succeeded by his son, Abd-ul-Aziz, who carried on the same policy with vigor and success. Extending his sway to Hasa (Al-Ahsa, as Col. Pelly spells it, and anciently Hajr), and other places on the Persian gulf, he was brought in hostile contact with the Turkish authorities of Bagdad, and from that place an expedition was sent in 1797 against the Wahabis by way of Hasa; but it failed to penetrate into Nejed, and proved fruitless. The Wahabis now grew bolder in their plundering excursions toward the Euphrates, and in 1801, Sa'ud, the son of Abd-ul-Aziz, led an army against the holy city of Meshed Hussein, or Kerbela, took it, massacred the greater part of the inhabitants, destroyed the tomb of Hussein, the grandson of Mohammed, and carried off the treasure. On this, a second Turkish army was sent from Bagdad against Nejed, but was routed, and the greater part slain. The conquest of Hejaz was next undertaken by the Wahabis. For two or three years, Ghaleb, the ruler of Mecca, had been more and more hemmed in by neighboring chiefs who had joined the Wahabis, and now, in 1803, Sa'ud collected a large army, and defeating Ghaleb in several battles, laid siege to Mecca, which, after a resistance of two or three months, surrendered at discretion. Not the slightest excess was committed, but the people had to become Wahabis—"that is, they were obliged to pray more punctually than usual, to lay aside and conceal their fine silk dresses, and to desist from smoking in public. Heaps of Persian pipes, collected from all the houses, were burned before Sa'ud's headquarters, and the sale of tobacco forbidden."—Burckhardt.

Failing to take Jiddah, into which Ghaleb had thrown himself, the Wahabi forces went northward, and, in 1804, took Medina, where they stripped the tomb of Mohammed of its accumulated treasures, and prohibited the approach to it of all but Wahabis, as they considered the reverence paid to it by the Turks and others as idolatrous. At

* Nothing is more perplexing than the orthography of Arabic proper names; every traveler spells them in a way of his own. In comparing Burckhardt, Palgrave, and col. Pelly, it is often difficult to identify the places and persons spoken about.

Medina, "the Wahabis enforced with great strictness the regular observance of prayers. The names of all the adult male inhabitants were called over in the mosque after morning, mid-day, and evening prayers, and those who did not obey the call were punished. A respectable woman, accused of having smoked the Persian pipe, was placed upon a jackass, with the pipe suspended from her neck, round which was twisted the long flexible tube or snake; in this state she was paraded through the town."—Burckhardt.

During these events, Abd-ul-Aziz had been assassinated, in the end of 1803, by a fanatical Persian, whose family had been murdered by the Wahabis at Meshed Hussein. He was succeeded by his son, Sa'ud II., who had for some time conducted the wars, and was perhaps the ablest ruler and warrior of the dynasty. For several years after the conquest of Hejaz, he continued to extend and consolidate his power. Plundering incursions were made to the very vicinity of Bagdad, Aleppo, and Damascus; while the Wahabi sheik of Asir (lying s. of Hejaz) imposed the new faith on a great part of Yemen. On the east, Sa'ud took the islands of Bahrein, annexed a part of the Persian coast on the e. side of the gulf, and exacted tribute from the sultan of Oman. This brought him into conflict with Great Britain, which sent (1808) a force, and severely chastised the Wahabi pirates that infested the commerce of the Persian gulf.

While these external struggles were going on, several of the southern provinces of Nejed broke out in revolt, instigated mainly, perhaps, by the local chiefs, whose power, formerly independent, was now circumscribed, or altogether taken away by the central government; but the rising was speedily suppressed, and a terrible example was made of the province of Harik and the town of Hutah, which last was completely demolished, and its inhabitants (the male inhabitants were reckoned at 10,000) butchered almost to a man.

From 1802, the Wahabis had prevented the great pilgrim caravans from reaching Mecca, both because they held the observances of the Turk and Persian hajjis to be idolatrous, and also because they were scandalized at the gross immorality and indecency which were openly practiced by these pilgrims. It may easily be conceived what horror spread through the Mohammedan world when it was told that the tomb of the prophet had been despoiled by heretics, who prevented the faithful from performing the most sacred duty of their religion. Accordingly, the sultan of Constantinople, the acknowledged protector of Mohammedanism, as early as 1804, imposed on Mehemet Ali, the newly appointed pasha of Egypt, the task of recovering the holy cities. With the dilatoriness, however, characteristic of the east, nothing was done till 1811, when an expedition was sent against them, under the command of the pasha's son, Túsún-bey. Medina was taken by the Egyptian forces in 1812, and Mecca in the following year; and a protracted and desultory warfare, with varying success, was kept up with the Wahabis in Hejaz and around its confines. At last, in 1815, Ibrahim pasha (q.v.) undertook to penetrate into central Arabia and crush the hornets in their nests. The enterprise was facilitated by the death of Sa'ud in 1814. He was succeeded by his son Abdallah, who, though an able warrior, was less adroit in securing unity of action among the numerous tribes under his sway. It was not, however, till 1818, and after repeated conflicts, that Ibrahim succeeded in decisively breaking the Wahabi force, and capturing their capital, Deraijeh, which was laid in ruins. Abdallah-ibn-Sa'ud was sent to Constantinople, where he and some of his ministers were beheaded (1818). Ibrahim continued some months in Arabia, consolidating his conquests throughout Nejed and the adjoining provinces. His policy was one of gentleness and conciliation toward the chiefs and common people, and of stern repression toward the fanatical religious teachers; and except among these, his name is said to be yet popular throughout central Arabia. But the folly and tyranny of the vice-governors whom he left, soon caused a general insurrection; the Egyptians had to retire to Kasim; and Turki, a son of Abdallah, was proclaimed sultan of Nejed, Riad being now chosen as the capital. Renewed expeditions were undertaken by the Egyptian commanders, driving, first, Turki from his capital for a time, and then his son and successor, Feysul; instead of whom, a chieftain favorable to Egyptian rule was appointed. But soon after the death of Mehemet Ali (1849), the Egyptians gave up the struggle; Feysul was recalled from exile; and under him and his son and vicegerent, Abdallah II., the Wahabi sway had become more powerful and extensive than ever. In 1870 Feysul was assassinated, and the dissensions between his two sons Abdallah and Sa'ud led to a civil war. This gave occasion to the Ottoman government to send a military force into the Persian gulf, which occupied Hofhuf, the capital of Hasa, but was unable to penetrate further into Nejed.

According to Burckhardt, there is not a single new precept in the Wahabi code. The only difference between the sect and the orthodox Turks (improperly so termed) is, "that the Wahabis rigidly follow the same laws which the others neglect, or have ceased altogether to observe. To describe, therefore, the Wahabi religion, would be to recapitulate the Mussulman faith; and to show in what points their sect differs from the Turks, would be to give a list of all the abuses of which the latter are guilty." One peculiarity of the Wahabis is their zeal against gaudy dress—silk and gold ornaments—and tobacco. In their wars of conversion, "No smoking" has been a kind of battle-cry. The recent traveler, Palgrave, who came into more intimate contact with the Wahabis than Burckhardt, has a much less favorable opinion both of their doctrines and their practice. He describes their empire as "a compact and well-organized government, where centraliza-

tion is fully understood, and effectually carried out, and whose mainsprings and connecting links are force and fanaticism. It is capable of frontier extension, and hence is dangerous to its neighbors, some of whom it is even now swallowing up. Incapable of true internal progress, hostile to commerce, unfavorable to arts and even to agriculture, and in the highest degree intolerant and aggressive, it can neither better itself nor benefit others; while the order and calm which it sometimes spreads over the lands of its conquest are described in the oft-cited *Ubi solitudinem faciunt, pacem appellant* of the Roman annalist. We may add, that its weakest point lies in family rivalries and feuds of succession, which, joined to the anti-Wahabian reaction existing far and wide throughout Arabia, may one day disintegrate and shatter the Nejedean empire, yet not destroy it altogether. But so long as Wahabiism shall prevail in the center and uplands of Arabia, small, indeed, are the hopes of civilization, advancement, and national prosperity for the Arab race." Col. Pelly characterizes the Wahabis as "Warlike Mohammedan Quakers."

The tenets of these puritans have taken root among the Mussulman population of India, and caused very considerable uneasiness. About 1826 Sejjid Ahmed became a convert to the Wahabite doctrines and preached them in the province of Oudh. Through the writings of his disciple Mohammed Ismail, the new faith drew many believers.

The following statistical table of the Wahabian empire was drawn up by Palgrave, mostly from the official registers at Riad:

Provinces.	Towns or Villages.	Population.	Military Muster.
1. Aared	15	110,000	6,000
2. Yemamah	32	140,000	4,500
3. Harik	16	45,000	3,000
4. Aflaj	12	14,000	1,200
5. Wadi Dowasir	50	100,000	4,000
6. Seley'yel	14	30,000	1,400
7. Woshem	20	80,000	4,000
8. Sedeyr	25	14,300	5,200
9. Kasim	60	300,000	11,000
10. Hasa	50	160,000	7,000
11. Katif	22	100,000	.....
Total	316	1,219,000	47,300

A more recent estimate places the total population of the empire at 1,133,000. A good many of the towns are large, and populous to a degree that the current notions of central Arabia would hardly lead us to look for. The following are among the most important of these towns: Eyun, Bereydah, Oneyzah, Toweym, Horeymelah, Mejmaá, Riad, the capital, Kharfah, and Hofhuf (Al-Hufhuf). Katif (Khutif) is the most direct port of the Wahabian dominions; and the province of Hasa in which it is situated is the richest.

To the n. of Nejed and its dependencies lies a kingdom formerly ruled over by a half-hearted ally of Feysul's Telal, the chief of Djebel Shomer, and consisting of five provinces — Djebel Shomer, Djowf, Kheybar, Upper Kasim, Teymar. This part of Arabia was overrun and converted during the first outbreak of Wahabi propagandism; but the conversion was only seeming, and during the interference of Egypt in Arabian matters the country regained a kind of independency. Since the death of Telal, Ottoman interference has been attempted. The great majority of the people are averse to Wahabiism. Still, the Wahabis have numerous partisans and missionaries and spies in all the towns, and their influence is hated and feared by prince and people. Even Oman, where the new Islam is said to be still more distasteful, has been brought in some degree under the political sway of the Wahabis, and pays a small yearly tribute.

Karsten Niebuhr (q.v.) is the first European writer who mentions the Wahabis; Burckhardt, *Notes on the Bedouins and Wahabis* (1830), gives a sketch of the Wahabi doctrines and of their history down to 1815; sir Harford Jones Brydges, for many years resident at Bagdad, to his *Account of the Transactions of His Majesty's Mission to the Court of Persia*, appends a "Brief History of the Wahauby;" Mengin, *Histoire de l'Egypt sous le Gouvernement de Mohammed Ali;* Corancez, *Histoire des Wahabis*, with maps. The most recent authorities on the subject are W. G. Palgrave's *Narrative of a Year's Journey through Central and Eastern Arabia*, 1862–63 (Macmillan & Co., 1865); and *A Visit to the Wahabee Capital*, by Lieut.Col. L. Pelly, H.M. political resident, Persian gulf, in *Geog. Soc. Journal*, 1865. See *Proceedings* of the Geog. Soc., 1880; *A Pilgrimage to Nejd*, 1881.

WAHKIAK'UM, a co. situated in s.w. Washington, having the Columbia river for its s. boundary; 244 sq.m.; pop. '90, 2526, chiefly of American birth. Co. seat, Cathlamet.

WAHOO. See ELM.

WAIB'LINGEN, a t. of Würtemberg, on the Rems, in the circle of the Neckar; pop. '90, 4786. It usually gets the credit of having given to the family of the Hohenstaufen

the title which became Italianized into Ghibellines (see GUELPHS AND GHIBELLINES) but Raumer (q.v.), the historian of the Hohenstaufen dynasty, upholds the claim of another Waiblingen in Würtemberg, on the Kocher, in the circle of Jaxt.

WAIFS, in English law, are goods stolen, and waived or abandoned by the felon on being pursued. The goods belong to the crown, but the owner, on doing diligence to prosecute and convict the thief, can have them again,

WAINSCOT (Sax. *wag*, a wall, and *scot* or *schot*, corresponding to Ger. *scheit*, a split or cut piece of timber—from *scheiden*, to divide; the word would thus mean wall-timber or boards), the name given to boards lining the interior walls of apartments. Such lining, usually in panels, is very common in Elizabethan architecture. The name is frequently applied to the best kinds of oak boards, from oak having been so much used for paneling.

WAINWRIGHT, JONATHAN MAYHEW, D.D., D.C.L., 1793–1854; b. England; of American parentage; came to this country, 1803, and graduated at Harvard college, 1812; became rector of Christ church, Hartford, Conn., 1816; assistant minister of Trinity church, New York, 1819; rector of Grace church, 1821; of Trinity church, Boston, 1834; took charge of St. John's chapel, Trinity parish, New York, 1837; visited Europe and the east, 1848–49, and Europe a second time, 1852, when he received from Oxford the degree of D.C.L.; elected provisional bishop of the diocese of New York, and consecrated in Oct., 1852. Among his published writings are: *There cannot be a Church without a Bishop* —a controversy with Rev. Dr. Potts, and *The Pathways and Abiding-Places of our Lord.*

WAIST, in a ship, is that portion of the upper deck lying between the fore and main masts. In it the larger boats are stowed, and along its gunwale the crew pile their hammocks during the day. In a steamer the waist is much broken into by the engine-room.

WAITE, HENRY RANDALL, PH.D., b. N. Y., 1845; graduated at Hamilton college, 1868; studied at Union theological seminary (Presbyterian), New York; resided in Europe, 1871–74, organizing American chapels at Rome and Geneva, and being chaplain at Rome; became editor of *Daily Evening Journal* at New Haven, 1874; associate editor of *International Review* at New York; lecturer on political science in the Syracuse university; and president of the political science association and of the national reform league, both of which were organized by his efforts. He has published *Sermons from the life of St. Paul at Rome,* and has written other works.

WAITE, MORRISON REMICK, LL.D., b. Lyme, Conn., 1816; graduated at Yale college, 1837, a classmate of William M. Evarts and Edwards Pierrepont; studied law at Lyme, and after his admission to the bar moved to Ohio, where he practiced successfully in Maumee City and Toledo. In 1849 he served in the state legislature, but after that, though frequently offered political and judicial positions, declined all nominations and built up a large practice in the higher branches of the law. In 1871 he was one of the counsel for the United States in the Geneva arbitration on the *Alabama* claims. He was president of the constitutional convention of Ohio, 1873, and in March of the next year was nominated as chief-justice of the United States by President Grant and confirmed by the senate. He d. 1888.

WAITS (anciently spelled *waightes*) is a name which has, at successive periods of our history, been given to different classes of musical watchmen. The word is one, in slightly varied forms, common in the sense of guard or watchman to all the Germanic languages. It is the German *wacht* or *wache*, Dutch *wagt*, Danish *vaght*, Swedish *wakt*, Scotch *wate*, and the English *watch*. How the word in the form of waits came to be exclusively applied to musical watchmen in England and Scotland, it is impossible to say. In the time of Edward IV. the waits appeared to have formed a distinct class from both the watch and the minstrels. It was their duty, we learn from Rymer's *Fœdera*, to pipe the watch nightly in the king's court from Michaelmas to Shrove Thursday four times, in the summer nights three times, and to make "the bon gayte" at every chamber door and office, for fear of pyckeres and pillers. The waits were not confined to the court; there were musical watchmen at an early period in many provincial towns. In Exeter a regular company existed in 1400. Beaumont and Fletcher (*Knight of the Burning Pestle*) speak of the "waits of Southwark as rare fellows as any in England." The word in the provinces was afterward sometimes applied to the town musicians, who may have represented the old waits, but who had no duties to perform as watchmen. The name was also given to the town band, or to private musicians when employed as serenaders. In this sense it is used in the *Tatler* (No. 222). The writer says that it had become so much the custom for lovers to employ the waits to help them through their courtship in Nottingham, that the ladies of that place could get no sleep by reason of riotous lovers who infested the streets with violins and bass-viols between 12 o'clock and 4 in the morning. Till recently the waits were officially recognized in London and Westminster. In London the post of leader of the waits was purchased; in Westminster the appointment was in the gift of the high constable and court of burgesses. In 1820 a Mr. Munro obtained the post of official leader of the waits for Westminster, with the exclusive right to serenade the inhabitants, and make application for Christmas-boxes. His prerogatives were invaded by other musicians, and he prosecuted several persons before the police courts. At present, in the metropolis, the waits are musicians who play during the night or early in the morning for two or three weeks before Christmas.

They call afterward at the houses of the inhabitants to ask for a Christmas-box. In Glasgow there were waits at an early period. The magistrates still grant a certificate to a few musicians, generally blind men, who play in the streets during the night and morning for about three weeks previous to New Year's day. Like the London waits, they call at the houses of the inhabitants, show their credentials, and ask a small subscription.—See Chambers's *Book of Days*, vol. ii. p. 742.

WAITZEN, a t. of Hungary, in the co. of Pest-Pilio-Soit, on the left bank of the Danube, 20 m. n. of Budapest, on the Vienna and Pesth railway. It is a bishop's see, and contains a noble cathedral with conspicuous dome. Pop. '90, 14,450.

WAIVER, in law, the neglect or refusal of a person to take advantage of his right. Every person must claim the exercise of his rights at the proper moment; his neglect or relinquishment will be regarded as a waiver. A party bringing suit against another may sometimes waive one remedy and pursue another.

WAKE (from the Anglo-Saxon *wacian*, to watch) is the English equivalent of the ecclesiastical vigil (q.v.). In early times, the day was considered as beginning and ending at sunset; Sundays and holidays, in consequence, began not on the morning, but on the previous evening (the *eve* of the holiday), and worshipers then repaired to the churches for worship. The following day was spent in amusement. Each church when consecrated was dedicated to a saint, and on the anniversary of that day was kept the parish wake. In many places, there was a second wake on the birthday of the saint. On these occasions, the floor of the church was strewed with rushes and flowers, and the altar and pulpit were decked with boughs and leaves. In the churchyard, tents were erected to supply cakes and ale for the use of the crowd on the morrow, which was kept as a holiday. The second part of the festival seems to have made most impression on the popular mind, and the word wake came to be applied to it. Crowds resorted to the wakes from neighboring parishes, hawkers or merchants were attracted by the crowds, and ultimately they became mere fairs or markets, little under the influence of the church, and disgraced by scenes of indulgence and riot. In 1285, Edward I. passed a statute which forbade fairs and markets to be held in country churchyards; but it does not appear to have put an end to the evil. In 1448 Henry VI. ordained that all showing of goods and merchandise, except necessary victuals, should be discontinued on the great festivals of the church. These regulations do not seem to have been strictly enforced. An act of convocation passed in 1536, during the reign of Henry VIII., seems to have effected a more important change. It ordered the day of the dedication of the church to be kept in all parishes on the first Sunday in October, and gradually that festival ceased to be observed. The saint's-day festivals were not, however, affected, and they are still kept in many English parishes under the name of "country wakes." A *lyke-wake* or liche-wake is a watching of a dead body (A.-S. *lic*) all night by the friends and neighbors of the deceased. The custom no doubt originated in superstitious fear either of passing the night alone with a dead body, or of its being interfered with by evil spirits. It must at all times have led to scenes ill suited to the occasion, and it now survives only among the lower classes in Ireland.—See Brand's *Popular Antiquities*.

WAKE, a co. in central North Carolina; 940 sq. m.; pop. '90, 49,207. It is the most populous county in the state. Co. seat, Raleigh; capital of the state.

WAKE, William, D.D., 1657–1737; b. England; graduated, Oxford, 1676; accompanied viscount Preston as chaplain to the English embassy to France; returning, was elected preacher to Gray's inn; had a long theological controversy with Bossuet; canon of Christ church, 1689; rector of St. James, Westminster, 1693; dean of Exeter, 1701; bishop of Lincoln, 1705; archbishop of Canterbury, 1716. He published a translation of *Apostolic Fathers;* three volumes of *Sermons*. He bequeathed his library and collection of coins, valued at £10,000, to Christ Church college, Oxford.

WAKEFIELD, a town in Middlesex co., Mass., on the Boston and Maine railroad; 10 miles n. of Boston. It was incorporated in 1868; contains several villages; and has the Beebe town library, public parks, armory, national, savings, and co-operative banks, electric light and street railroad plants, and manufactories of rattan goods, stoves, shoes, pianos, and ladies' underwear. Pop. '90, 6982.

WAKEFIELD, an important and handsome t. in the West Riding of Yorkshire, overlooking the Calder, 8 m. s. of Leeds, on the Lancashire and Yorkshire railway. The town consists of three principal and many minor streets, and among the chief buildings are the parish church, conspicuous from its lofty and elegant spire; the grammar-school (1591), a wealthy institution, attached to which there are exhibitions to the universities; the library and news-rooms, corn exchange, etc. Its benevolent and scientific institutions are numerous and important. The town has long been famous for its manufactures of woolen yarn and cloths. The district around Wakefield is agricultural, and the town is noted for its corn and cattle markets. Coal-mines are worked in the vicinity. Wakefield returns one member to the house of commons. Pop. '91, 33,146.

WAKEFIELD, Edward Gibbon, 1796–1862; b. England; became a land-surveyor. In 1826 he was imprisoned in Newgate on a conviction for forcibly abducting an heiress —with whom he went through a "Gretna Green" marriage, declared void by act of parliament. His three years' imprisonment furnished him material for a work on prison management. He subsequently resided in Australia, France, and New Zealand; intro-

duced the "Wakefield colonization system," somewhat resembling the pre-emption plan of the United States; took part in abolishing penal transportation; and wrote *A View of the Art of Colonization*, and other treatises on social and political questions. He died in New Zealand.

WAKEFIELD, ROBERT, 1480–1537; b. England; educated at Cambridge and on the continent; taught Greek, Hebrew, Chaldaic, and Syriac in France and Germany; prof. of Hebrew at the university of Louvain, 1519; returning to England became king's chaplain; advised Henry VIII. in regard to his divorce from Catharine of Aragon; lecturer in Greek at Cambridge, 1524; prof. of Hebrew at Oxford, 1530; canon of Wolsey's new college, 1532. He published various books, and was pronounced the greatest linguist of his time.

WAKE-ROBIN. See ARUM, TRILLIUM.

WAKULLA, a co. in n. Florida, having Apalachee bay and the gulf of Mexico on the s.e.; about 540 sq.m.; pop. '90, 3117. Co. seat, Crawfordville.

WALACHIA. See MOLDAVIA.

WALBRIDGE, HIRAM, 1821–70; b. Ithaca, N. Y.; graduate of Ohio university, 1841; studied law in Toledo, O.; admitted to the bar, 1843; brig.gen. of Ohio militia, 1844; engaged in business in New York in 1847. He was a democrat in politics; member of congress, 1853–55; opposed the civil war, declined a seat in President Lincoln's cabinet, but worked sedulously for the commercial interests of the country. He was on the Pacific railroad committee, 1869, and took a prominent part in the national commercial conventions at Chicago, Detroit, and Louisville.

WALCHEREN, an island in the Netherlands province of Zeeland, at the mouth of the Scheldt. The chief places are Middleburg, Flushing, and Vere or Campvere (q. v.). The surface is even, and a large part consists of rich arable land. Where it is not protected by natural downs, strong dikes have been formed, that at West Kappella being a magnificent work. The drainage water is carried off by large sea-sluices at Middleburg and Vere, and the island is crossed by a canal. Agriculture is the principal employment, and wheat, madder, and garden fruits are raised. Cattle rearing and the fisheries also give employment to many. The capital is Middleburg, and the chief port is Flushing. From the latter town, a railway has been constructed through w. and s. Beveland to Bergen-op-Zoom, joining the other continental lines. Flushing has a considerable shipping trade. The people are chiefly Protestants. In many parts are large artificial mounds, supposed to have been erected by the early inhabitants as places of refuge from high tides.

WALCHEREN EXPEDITION, one of the most disastrous military failures in the history of modern warfare, was undertaken, like that of sir John Moore to Spain, with the view of helping the continental allies of Britain, by creating such a diversion as would prevent the concentration of Napoleon's strength, in overwhelming amount, against any one of his opponents. The expedition was planned in 1807, when Prussia, Russia, and Austria were all in arms against France; but it was not till early in the summer of 1809 (when Napoleon, who had meantime overwhelmed Prussia, and reduced Russia to neutrality, was gradually forcing Austria to succumb) that the British ministry resolved to carry it out. The plan was to send a fleet and army up the Scheldt and attack Antwerp (the principal naval station and arsenal in the n. of France), whose fortifications, though formidable, were much in need of repair, and whose garrison at the time only numbered about 2,000 invalids and coast-guards; while there were not more than 10,000 French soldiers in Holland. The expedition, after numberless needless delays, at last sailed on July 28; and, to the number of 37 men-of-war, 23 frigates, 115 sloops and gunboats, accompanied by transports, carrying about 41,000 soldiers, reached the Dutch coast on the following day. But, instead of obeying the orders of the minister of war, lord Castlereagh, to *advance at once in force against Antwerp*, the commander-in-chief, lord Chatham (the elder brother of Pitt), frittered away his time in the reduction of Vlissingen (Flushing), which was not effected till Aug. 16, by which time the garrison of Antwerp had been re-enforced by king Louis Bonaparte with the troops at his command (about 6,000), and by detachments sent from France, which swelled the garrison, by Aug. 20, to 15,000 men. About the end of August, Chatham, who, as a general, was a methodical incapable, "found himself prepared" to march upon Antwerp, but by this time 30,000 men, under Bernadotte, were gathered to its defense, and the English army was decimated by marsh-fever, so that success was not to be hoped for. However, it was judged right to hold possession of Walcheren, in order to compel the French to keep a strong force on the watch in Belgium, and, accordingly, 15,000 men remained to garrison the island, the rest returning to England; but the malaria proved too fatal in its ravages, and as peace had been concluded between Austria and France, this force was also recalled. Thus an excellently devised scheme, through the utter stupidity of the agent chosen by royalty to carry it out, failed in every point of consequence, and ended in a loss of 7,000 men dead, and the permanent disablement of half the remainder. The failure of the Walcheren expedition

was made the occasion of furious onslaughts on the ministry in the house of commons and in the public journals.

WALDECK, a principality of Germany, consisting of the old co. of Waldeck, inclosed between Westphalia, Hesse-Cassel, and Prussia, and the small co. of Pyrmont, about 30 m. n. of Waldeck. The form of government was a constitutional and hereditary monarchy; but since 1868 the administration has been under the control of Prussia, and one member is sent to the Bundesrat and one to the Reichstag. The entire area was 433 sq. miles. Pop. '95, 57,766. The elevation of the country is greater than that of most districts of Northern Germany; and the scenery, continually alternating between mountain and valley, forest and plain, comprises scenes of much natural beauty. The two largest rivers are the Eder and Diemel, affluents of the Weser. Among the minerals found are gold, copper, iron, and lead; and mineral springs occur. Agriculture and cattle-breeding are by far the most common pursuits of the people, and with the exception of leather, no articles are manufactured to any extent. Capital, Arolsen.

WALDEN, John Morgan, d.d., b. in O., 1831; began his career as an itinerant preacher of the Meth. Epis. church in Ind.; was connected with the *Cincinnati Commercial*, and was prominent in the anti-slavery struggle in Kansas. He was supt. of public instruction for Kansas; preached in Cincinnati, 1860-68; was a secretary of the Freedman's Aid commission; and was elected bishop of the Meth. Epis. church, 1884.

WALDENSES (Valdenses, Valdesi, Valesi, Vaudois), are a Christian community who inhabit a mountain tract on the Italian side of the Cottian Alps, s.w. from Turin. The district is bounded on the n. by the Dora Ripaira, on the s. by the Po. It is inclosed on all sides by the spurs of the Alps, which divide it into three valleys—that of Perosa, drained by the Clusone; that of San Martino, drained by the Germanasca; and that of Lucerna, drained by the Pelice, all tributaries of the Po. These valleys lie between France and Italy, and immediately s. of the great western route into Italy by the passes of Mont Cenis and Genevre. The inhabitants are thus brought into communication with both countries; indeed, they speak a dialect more closely allied to those of Dauphiné than to those of Piedmont; and they have used French as well as Italian as the language of their liturgy. The religious doctrines of the Waldenses are now similar to those of the Reformed churches. There is a minister in each parish, called a *barbe*, and the synod is presided over by an elected *moderator*. The Waldenses had at one time bishops, but that was when the sect was more widely spread than it now is. Much has been said of the origin of the Waldenses. Their own historians assert that the community has remained from apostolic times independent of the church of Rome, and boast that they can show a regular apostolic succession of bishops from the earliest period of Christianity till that of the reformation. This statement has been very generally admitted by uncritical writers, but in the light of recent investigations, would seem to be no longer tenable. Dieckhoff (*Die Waldenser im Mittelalter*, Gött. 1851) and Herzog (*Die romanischen Waldenser*, Halle, 1853), have submitted the early history of the Waldenses to a critical examination; and the result to which they have come, after an examination of the manuscript records, is, that the Waldenses had not the early origin claimed for them, and were not Protestants before the reformation, although they entertained some opinions which, so far, were in anticipation of those held by the reformers. They are also of the opinion that the Waldenses do not take their name from *val, vallis*, a valley, as has been assumed, but from Peter Waldo of Lyon, a merchant of the 12th c., who was less the founder of a sect than the representative and leader of a wide-spread struggle against the pretensions of the clergy. The church would have tolerated Peter Waldo, as it had tolerated St. Francis of Assisi, the founder of the Franciscans, and perhaps have allowed him to form a new order, had he not trenched upon ground dangerous to the hierarchy. But he had the four gospels translated, and maintained that laymen had a right to read them to the people. He attacked most violently the whole body of the Church and the clergy, and brought down their wrath upon himself. His opinions were condemned by a general council in 1179, and he retired to the valleys of the Cottian Alps. A long series of persecutions followed, but Waldo's followers could not be forced to abandon their opinions. They continued to be known as the *Leonisti*, from the place of their origin—the poor people of Lyons, from their voluntary penury—*Sabotati*, from the wooden shoes they wore—and *Humilitati*, on account of their humility. It was natural that a body so severely shunned should stand aloof from the church, and even offer armed resistance; yet we have no evidence of the manner in which the Waldenses first became a separate community. They are now shown to have been identical with the followers of Waldo, but they must not be confounded with the Albigenses, who were persecuted at the same period. The protest of the Waldenses against the church of Rome only related to practical questions, that of the Albigenses related to matters of doctrine.

The Waldenses at first seem to have spread in the upper valleys of Dauphiné and Piedmont, to which Waldo retired. They were subjected to persecutions in 1332, 1400, and 1478, and driven into many parts of Europe, where their industry and integrity were universally remarked. So widely had the sect been scattered, that it was said a traveler from Antwerp to Rome could sleep every night at the house of one of the brethren. In Bohemia many of them had settled, and they, without forsaking their own community,

joined the Hussites, Taborites, and Bohemian brethren—a connection which led to a change in the principles of the Waldenses. They adopted the doctrines of the reformers, and this led to more serious persecutions than any they had previously undergone. Francis I. of France, in possession of Piedmont in 1541, ordered them to be extirpated. They were massacred at various places in Dauphiné and in the valleys they still occupy, more especially at Merindol and Cabrière. Several persons who refused to abandon their faith were burned alive, yet the sect continued to exist. In 1560 the duke of Savoy, who had recovered possession of Piedmont, urged by Pope Paul IV., forbade the Waldenses to exercise their faith, under the penalty of being sent to the galleys for life. The Waldenses sent him a petition and apology for their creed, which appeared to him so plausible, that he suggested that a conference should take place between the Waldensian and Romanist divines. He was, of course, told that the proposition was monstrous, and urged by the pope and the courts of Spain and France so effectually, that he dispatched 7000 men into the valleys, who were joined by two French regiments. The Waldenses offered a gallant resistance, but were overwhelmed by superior force. Many prisoners were burned alive, and women and children were at times slaughtered. The duke was displeased with these severities, and although denounced as no better than a heretic at Rome, granted the Waldenses an amnesty on condition that their service should only be performed at certain places in the valleys of Lucerna and San Martino. The Waldenses in the other districts, and especially the marquisate of Saluzzo, were then opposed by the Jesuits. Charles I. of England sent two embassies to the duke of Savoy to intercede in their behalf, but without avail. Victor Amadus I., not long after, ordered the Waldenses of Saluzzo, under the penalty of confiscation of property and death, to become Catholics; and the edict was so rigorously carried out that, in a few years, none of the sect remained in the district. Charles Emmanuel II., in 1655, directed a fresh crusade against these Waldenses. Some time before, the people of Lucerna, inflamed, it is said, by the discourses of Jean Leger, a popular preacher, set fire to a convent of Capuchins, and committed other excesses. An inquiry was made, and it was found that the Waldenses had purchased property and built churches and schools in districts where no concessions had been granted them. They were ordered within 20 days to sell their property, or profess Catholicism. They resisted, under leaders named Jayer and Janavel, but they could not oppose the forces sent against them. No quarter was shown to women and children, and severe measures were taken—more especially by the French and Irish mercenaries in the service of the duke—which, recorded by Jean Leger, were heard of with indignation in all Protestant countries. Subscriptions were made in England for those who had survived the massacre. The Swiss cantons, and the states of Holland, sent envoys to the duke. Cromwell addressed Latin letters to him, written by Milton, and also sent sir Samuel Morland, who collected numerous manuscripts connected with the history of the Waldenses, and brought them to England with him. A convention was concluded, by which the Waldenses were allowed again to exercise their worship. In 1685 Louis XIV. revoked the edict of Nantes, and ordered the duke of Savoy to compel the Waldenses to adopt Catholicism. They were accordingly commanded to emigrate or abjure their tenets within 15 days. They resisted, and were attacked by the troops of the duke on one side, and those of Louis XIV. on the other. They were overpowered, and the survivors could make no conditions. A large number were imprisoned at Turin, where many died; others were allowed to emigrate. Their whole property was confiscated, and handed over to Roman Catholic colonists. When the prince of Orange became king of England, the Waldenses who had settled in Switzerland resolved to return to their valleys under the guidance of Henry Arnaud, one of their pastors. In 1689 they gathered from all quarters to the rendezvous in the great forest of the Pays de Vaud. On the night of Aug. 16, they embarked on the lake of Geneva, landed on the opposite shore, and after encountering the most determined opposition, reached the valley of San Martino, after a perilous march of 31 days. During the winter a French army of 22,000 men entered their territories, and in the following summer attacked their fortifications, but were repulsed with great slaughter. Fortunately, the French and Piedmontese at this juncture quarreled, and the latter, to secure the services of the mountaineers, granted them an amnesty. They are said to have fought not less than 18 battles against the French, and to have lost only 30 men. This was the last persecution against the Vaudois; but it was not till 1848 that they were put on a level with their Catholic fellow-subjects. They had then 18 pastors and 15 congregations; in 1891 there were 17 mountain churches and 78 Sunday-schools; besides 43 congregations and 56 preaching stations in other parts of Italy, with 4428 communicants and 511 catechumens. The *Libera Chiesa*, a Protestant Italian church, is not connected with the church of the Valleys. The Waldenses have a college at Florence, and publish several denominational and missionary journals. See the works of Botta, Bender, Morland, Gelly, Muston.

WALDENSTRÖM, Paul, d.d., ll.d., a Swedish theologian and statesman, was born in 1838. He graduated at the University of Upsala in 1863, and entered the ministry; but in 1872 excited a controversy by advocating a moral theory of the atonement, and in 1877 he became the recognized leader of the Free Church movement. Since 1885 he has been a teacher in theology in the state school at Gefle, and also a member of the Swedish parliament. In 1889 he visited the United States, and was given the degree of

D.D. by Yale university. He has published, among many works, *The Lord is Holy; Reconciliation;* and a Commentary on the New Testament.

WALDO, a co. in s. Maine, having the Penobscot river on the e., the Penobscot and Belfast bays on the s.e.; 705 sq. m.; pop. '90, 27,759. It has a large export trade and important manufactures. Co. seat, Belfast.

WALDO, PETER. See WALDENSES.

WALDOBORO, a town in Lincoln co., Me.; on the Medomak river and the Maine Central railroad; 16 miles w. of Rockland. It was settled by German emigrants in 1748, and incorporated as the 32d town in Maine in 1773. It contains a public high school, circulating library, national bank, weekly newspaper, several shipyards, granite and marble works, lumber and saw mills, shoe and stave factories, canned goods, and carriages. Included in the town are several villages and a number of islands in the bay, the former comprising North Waldoboro, South Waldoboro, West Waldoboro, Orff's Corner, and Winslow's mills. The town is named after Gen. Waldo, who obtained a patent for the land from George II., and induced the German settlement. Pop. '90, 3505.

WALDSTEIN, CHARLES, A.M., L.H.D., PH.D., archæologist, was born in New York City, March 30, 1856. He studied at Columbia and at Heidelberg, receiving the degree of Ph.D. from the latter in 1875. In 1876 he studied both in Leipsic and in the British museum in London, and also delivered a course of art lectures in the museum. He spent 1878–79 in Italy and Greece. In 1880 he became lecturer in classical archæology at Cambridge, and in 1882 "Reader" in Greek art. In 1883 he delivered a course of lectures before the Royal Institute of Great Britain, and in 1886, a course at Columbia college. In 1888, while still holding his positions at Cambridge, he was appointed director of the American School of Archæology in Athens. In 1892 he was decorated with the order of the Saviour by the King of Greece. He has published *The Balance of Emotion and Intellect* (1878); *Essays on the Art of Pheidias* (1885); *The Work of John Ruskin* (1893), etc.

WALES. See the articles ENGLAND, GREAT BRITAIN, PRINCE OF WALES.

WALES, NEW SOUTH. See NEW SOUTH WALES.

WALES, THE PRINCE OF. See ALBERT EDWARD, PRINCE OF WALES.

WALEWSKI, ALEXANDRE FLORIAN JOSEPH COLONNA, Count and Duke, 1810–68; b. Poland; reputed son of Napoleon I. by a Polish lady; educated at Geneva; fought in the Polish army; went to France after the fall of Warsaw, 1830; entered the army and was made capt.; relinquished military life and devoted himself to politics and literature; was sent to Egypt by M. Thiers on a diplomatic mission; received appointments under the Guizot ministry; was *chargé d'affaires* to Buenos Ayres at the outbreak of the revolution, 1848; was sent by Louis Napoleon ambassador to Florence, 1849; to London, 1854; minister of state, 1860–63; president of legislative assembly, 1865–67; was editor of the *Messager*, and published *Un mot sur la question d'Afrique; L'alliance Anglaise.*

WALHALLA (the hall of the fallen, i.e., heroes. See WALKYRIES), is, in northern mythology, the name of the place of residence for the fallen in battle. This brilliant hall stood in Gladsheim (the house of joy); in front of it was the beautiful grove Glasur, the trees of which bore golden leaves. Before the hall, which was so high that its summit could scarcely be seen, a wolf was hung, as a symbol of war, over which sat an eagle; the saloon itself, ornamented with shields, and wainscoted with spears, had 540 doors, through each of which 800 of the inmates (Einherjer) could walk abreast. For these Einherjer (i.e., the brave), who came after death to Odin, was it destined. Renowned chiefs, especially if they had desolated many countries, and wielded the blood-dripping sword far and wide, were met and welcomed by Bragi and Hermode as messengers from Odin. The hall was decorated to honor them; all the divine heroes stood up at their reception; the Walkyries tasted wine for them, which otherwise only Odin drank. All kings came to Walhalla, even when they did not die on the battle-field; in general, these joys seem to have been prepared only for those of high rank and the rich. As it was honorable to come to Walhalla with a great retinue, and to possess many treasures, the comrades of a leader who had fallen in battle killed themselves of their own free will, and in his grave were laid along with his horse and arms the treasures won in fight. Every morning the inmates marched out at the crowing of the cock, and fought furiously with another; but at midday all wounds healed, and the heroes assembled to the feast under Odin's presidency. Odin himself partook of nothing but wine; he gave the edibles to the wolves Geri and Freki, who sat beside him. The guests ate of the bacon of the boar Sahrimmer, and refreshed themselves with beer and mead, which flowed in abundance from the udder of the goat Heidrun; the attendant Walkyries handed them the drinking-horns, under Freyja's direction. Occasionally, the hero rode by night to his grave, where the beloved Walkyrie received him; he reposed in her embrace till, night disappearing, he exclaimed, "It is time to make the horse tread on the white stair of the sky; I must travel toward the west to the bridge of heaven before the cock awakes the warriors in Walhalla." The half of the fallen belonged to Freyja.

The name WALHALLA is also given to a magnificent structure erected by Ludwig I. of Bavaria (1830–41) as a temple of fame for all Germany. He conceived the project in 1806, when the fatherland was at its lowest point of degradation, and while he was yet crown-prince. The design of the building was by Klenze, and the chief sculptors of

Germany have contributed to the execution of the plan. It stands on an eminence 250 ft. above the Danube at Donaustauf, near Regensburg. The temple is of nearly the same dimensions and proportions as the Parthenon, and is built of marble. By means of statues, busts, reliefs, and tablets, the mythology and history of Germany are illustrated, and her greatest names commemorated. The undertaking cost 2,330,000 florins.

WALKE, HENRY, b. Virginia, 1808; entered the navy as midshipman, 1827. He took part in the capture of Tobasco, Vera Cruz, and Tuspan in the Mexican war, and ranked as commander at the beginning of the war of the rebellion. He held commands at the battles of Fort Henry, Fort Donelson, Island No. 10, Fort Pillow, the passage of the Vicksburg batteries, and other engagements; becoming a commodore in 1866, and rear-admiral in 1870; retired, 1871. He d. in 1896.

WALKER, a co. in n.w. Alabama, drained by the Black Warrior river and its affluents; 824 sq.m.; pop. '90, 16,078, includ. colored. Co. seat, Jasper.

WALKER, a co. in n.w. Georgia; about 404 sq.m.; pop. '90, 13,282, chiefly of American birth, inclu. colored. It contains Lookout Mountain and the famous battle-field of Missionary Ridge. Co. seat, Lafayette.

WALKER, a co. in e. Texas, drained by the Trinity and San Jacinto rivers; 740 sq.m.; pop. '90, 12,874, chiefly of American birth, inclu. colored. Co. seat, Huntsville.

WALKER, AMASA, LL.D., 1799–1875; b. Conn., was a merchant in Boston, 1825–40, and a prominent abolitionist; a delegate to the international peace conventions held in Europe, 1843 and 1849; a member of the Massachusetts legislature, 1848; a state senator, 1849; secretary of state, 1851–52; a member of the constitutional convention, 1853; and a member of congress, 1862–63; professor of political economy at Oberlin, 1842–49; and lecturer at Amherst, 1861–66. He published *Nature and Uses of Money and Mixed Currency; Science of Wealth;* a *Manual of Political Economy;* and, in connection with others, *Transactions of the Agricultural Societies of Massachusetts*, 7 vols.

WALKER, BENJAMIN, 1753–1818; received a business education; was a capt. in the 2d. N. Y. regiment; served as aid-de-camp to Steuben, and to Washington, 1781–82; secretary to the governor of New York after the revolutionary war; subsequently a broker in New York city. He was naval officer of New York under President Washington; member of congress, 1801–3. He was identified with the early settlement of Utica, N. Y., holding the position in 1797 of agent to the immense estates of the earl of Bute.

WALKER, FRANCIS AMASA, b. Boston, 1840; served in the war of the secession and was made brevet brig.gen., 1865; chief of bureau of statistics at Washington, 1869; superintendent of the census of 1870 and 1880; Indian commissioner, 1871; professor of political economy and history in the Sheffield scientific school of Yale college, 1873–81; chief of the bureau of awards of the Centennial exhibition, 1876; and after 1881, president of the Massachusetts institute of technology at Boston. Besides the census reports, he published *The Indian Question; The Wages Question; Statistical Atlas of the United States; International Bimetallism* (1896), etc. He d. in 1897.

WALKER, Rev. GEORGE, an Irish clergyman, distinguished for the part he took in the heroic defense of Londonderry against the army of James II., was born in the county of Tyrone, of English parents, in the early part of the 17th century. He was educated at the university of Glasgow, and, entering the church, became rector of Donoughmore. The early life of Walker was not remarkable. When the Irish army of James II. entered Ulster, and took possession of Kilmore and Coleraine, Walker sought refuge in Londonderry, the headquarters of "the Englishry" since the times of James I., when the confiscated lands of the county had been bestowed on the corporation of the city of London, and a Saxon colony, English and Scotch, had been planted there, who had converted a waste into the richest district of Ireland. The town was fortified sufficiently to protect it from the pike-armed Celtic peasantry, and it had resisted more than one attack. But it was not so defended as to oppose regular troops. Lundy, the governor, was in secret communication with the enemy, and prepared to hand over the town to them; but some of his own officers protested against this course, and the citizens, remarkable at the time for that high spirit which characterizes a dominant race, and the possession of those qualities which made the soldiers of Cromwell famous, determined not to yield. The bishop, Ezekiel Hopkins, in vain inculated the doctrine of passive obedience at a conference; he was interrupted by a lad, one of a daring band known as the "thirteen Scotch apprentices," who called out: "A good sermon, my lord—a very good sermon; but we have no time to hear it now." A Scotch fanatic named Hewson urged the Presbyterians not to ally themselves with the enemies of the covenant; but he was laughed at by his countrymen. The thirteen apprentices closed the city-gates, and defied the enemy. It was then that Walker, described as an aged clergyman who had taken refuge in the city, encouraged the townspeople to fight to the last. Walker saved Lundy from the rage of the populace, and enabled him to quit the city in safety. Maj. Baker, who soon after died, and Walker became joint-governors, aided by Capt. Adam Campbell. The siege is the most memorable in British history. It began in April, and lasted till the end of July, 1689. The inhabitants were reduced to the greatest extremities by hunger, but they were sustained to the last by the rousing

sermons preached to them by Walker in the cathedral, and the example he and Capt. Campbell set in heading sallying-parties. When the siege was raised by the English fleet entering the harbor, Walker went to London. He was warmly received at court, thanked by the house of commons, created D.D. by Oxford, and bishop of Derry by the king. Portraits of him were in every house in England, and his triumph would have been complete had the Presbyterians not thought that their share in the defense of the city was overlooked, and provoked useless controversy. Walker could not be induced to take quiet possession of his bishopric; he would head a troop at the battle of the Boyne, and he was there killed. A lofty pillar has been erected to his memory at Londonderry, and the Walker club and the Campbell club have kept alive to our times the recollection of the siege. Walker published in 1689 *A True Account of the Siege of Londonderry.*

WALKER, Gilbert Carlton, 1832–85; b. Binghamton, N. Y.; d. New York. He graduated at Hamilton coll.; interested early in politics; and was a successful lawyer in Chicago. Moving to Norfolk, Va., for his health, he became prominent in the business community as the founder of the Exchange national bank, the American fire insurance co., and the Atlantic iron works and dock co. As a candidate for membership of the Va. constitutional convention of 1867, he maintained strong ground against the party demanding test oaths and white disfranchisement; and although defeated in his canvass, he secured Pres. Grant's order to postpone the election which had been meant to sanction the views of his opponents. Soon afterwards, he became an independent candidate for the governorship of Va., the democrats withdrawing their nominee in his favor, thus securing his election by a large majority. He was elected, as a dem., to congress, 1874, serving two terms. His later life was spent at Binghamton and New York, in the practice of law.

WALKER, James, D.D., 1794–1874; b. Mass.; graduated at Harvard college in 1814, studied divinity, and was settled over the Unitarian church in Charlestown, 1818–39; when he became professor of moral and intellectual philosophy in Harvard college, of which he was president, 1853–60. Dr. Walker, who was editor of the *Christian Examiner*, 1831–39, published for undergraduate use editions of Reid *On the Intellectual Powers*, and Stewart's *Philosophy of the Active and Moral Powers; Sermons* (1861); *Memoir of D. Appleton White* (1863); and *Memoir of Josiah Quincy* (1867). He bequeathed to Harvard college his library and $15,000. He was a man of intellectual keenness and literary taste, with great moral fidelity and beauty of spirit.

WALKER, James Barr, D.D., b. Philadelphia, 1805; principal of an academy, New Durham, N. J.; studied law, Ravenna, Ohio, graduated at Western Reserve college, Hudson, Ohio, 1831; edited *Ohio Observer* at Hudson; *Watchman of the Valley*, Cincinnati; *Watchman of the Prairies;* studied theology; licensed as a Congregational preacher, 1841; established at Mansfield, Ohio, a private orphan asylum; preached at Sandusky; lecturer at Oberlin college and Chicago theological seminary on Harmony between Science and Revealed Religion. He published *Philosophy of the Plan of Salvation; God Revealed in Creation and in Christ; Philosophy of Skepticism; Philosophy of the Divine Operations in Human Redemption; Poems; The Living Question of the Age*, etc. He d. in 1887.

WALKER, James D., b. Logan co., Ky., 1830; removed to Ark., 1847; was admitted to the bar, 1850; fought as a col. in the confederate service, and after the war was solicitor-gen. of Arkansas. He was elected, as a dem., to the U. S. senate, 1878.

WALKER, John, 1732–1807; b. England; was a merchant, an actor, a school-master, and a teacher of elocution. In the last he attained great success in London, Oxford, Scotland, and Ireland. In 1772 he published *Pronouncing Dictionary of the English Language*, followed by *A Rhyming Dictionary; Elements of Elocution; The Critical Pronouncing Dictionary and Exposition of the English Language*, for many years the standard of the language; *Key to the Classical Pronunciation of Greek, Latin, and Scripture Proper Names; Outlines of Grammar.* He was educated a Presbyterian, but became a Roman Catholic.

WALKER, Robert James, 1801–69; b. Penn.; graduated at the university of Pennsylvania, 1819; studied law and was admitted to the bar, 1821. He began his political career at an early age. In 1826 he settled in Mississippi, became a prominent democratic leader, and was U. S. senator, 1837–45. He had great influence in destroying the U. S. bank, and in the admission of Texas to the union. From 1845 to 1849 he was secretary of the U. S. treasury. In 1857 he was made gov. of Kansas, but two years later resigned, "being unwilling to aid in forcing slavery on Kansas by fraud and forgery." He was loyal in the civil war, and as financial agent of the United States in Europe, effected large sales of U. S. bonds. He published the Mississippi Supreme Court Reports, 1818–32, *Arguments on the Mississippi Slave-Question*, 1841, and was for some time editor of a monthly magazine.

WALKER, Sears Cook, 1805–53; b. Mass.; graduated at Harvard college, 1824, taught school near Boston; removed to Philadelphia; taught and engaged in scientific labors; prepared, 1837, a plan for an observatory in connection with the high-school; contributed many observations to *American Journal of Science*, and the *Memoirs* of the *Philosophical Society;* published a memoir on the periodical meteors of August and November; was appointed to the Washington observatory, 1845; had charge of the longitude computations of the U. S. coast-survey, 1847; with Prof. Bache developed the method of determining difference of longitude by telegraph.

WALKER, Timothy, 1806–56; b. Mass.; graduated at Harvard college and the Harvard law school, and began the practice of law at Cincinnati in 1831. Two years later, in association with Judge Wright, he founded a law school in which he was professor till 1844. He became presiding judge of the Hamilton co. court of common pleas in 1842. He afterward edited the *Western Law Journal.* He wrote an *Introduction to the Study of American Law,* and other works.

WALKER, William, 1824–60; b. Tenn.; studied medicine and law; edited the *Crescent* newspaper, New Orleans; co-editor of *San Francisco Herald,* 1850; started in San Francisco, 1853, an expedition for the conquest of Sonora; landed at La Paz, Lower California; proclaimed the independence of the peninsula; declared himself president; captured two or three towns, annexed Sonora to his territory; received a re-enforcement under Col. Watkins, and with 100 men set out overland for Sonora; their provisions being exhausted, the party dissolved, Walker surrendered to the U. S. authorities at San Diego, was tried, and acquitted. He landed in 1855 with 62 men in Nicaragua, gained two battles, took possession of Granada, and was appointed generalissimo of the republic; afterward caused himself to be elected president. A powerful insurrection was excited by his arbitrary acts, and after several battles he surrendered, May 1, 1857, with 16 of his officers, to Com. C. H. Davis of the U. S. sloop-of-war *Mary,* and was taken to the United States. Again he set out, landing at Punta Arenas, Nicaragua, Nov. 11; was obliged by Com. Paulding, U. S. navy, to surrender with 132 of his followers, and taken as a prisoner to New York. June 16, 1860, he left New Orleans, landed at Truxillo, was captured, condemned by a court-martial, and shot.

WALKER, William David, d.d., b. New York, 1839; graduated at Columbia coll., 1859, and at the General theol. sem., 1862; ordained priest in the Prot. Epis. church, 1863. He had charge of Calvary chapel, New York; was consecrated missionary bishop of Northern Dakota, 1883, and as bishop of Western New York, 1896.

WALKER, William Johnson, 1790–1865; b. Charlestown, Mass.; son of Maj. Timothy Walker; graduate of Harvard university, 1810; studied medicine, practiced in Charlestown, and became distinguished as a surgeon. In 1861 he established professorships in mathematics at Williams and Tufts colleges, and built Walker chapel at Amherst; the worth of the property given being estimated at $90,000. The total amount of his gifts was $400,000, and at his death in Newport, R. I., he divided $1,000,000 in bequests for educational purposes.

WALKING-LEAF. See Leaf-insect.

WALKING-STICK, the popular name of many insects of the family *phasmidæ* (q.v.), destitute of wings, and having a long, slender, cylindrical body, like a small stick with the bark on, the delicate legs resembling little twigs. Their habits are very similar to those of the leaf-insects or walking-leaves, and their peculiar appearance is, in like manner, their protection. Most of them are natives of warm climates, and they are widely distributed. Some of them attain a large size. *Phasma gigas,* an East Indian species, is 7 or 8 in. long. A species, between 3 and 4 in. long, *P. femoratum,* is found even in the northern and north-western parts of the United States.

WALKY'RIES, beings of the Scandinavian mythology (q.v.), the legend of whom is the most terribly beautiful in the whole system. The name is derived from the old Norse *val,* which signifies a heap of slaughtered men, and *kjora,* to choose. *Val* itself contains the notion of chosen, elect, being allied to Ger. *wahlen,* Scotch *wale,* to choose. The walkyries, also called battle-maidens, shield-maidens, wish-maidens, are charming young women who, adorned with golden ornaments, ride through the air in brilliant armor, order battles, and distribute the death-lots according to Odin's commands. Fertilizing dew drops on the ground from the manes of their horses, light streams from the points of their lances, and a flickering brightness announces their arrival in the battle. With their charming glance, they rejoice the glazing eye of the hero, and lead him to Walhalla, where they act as his cup-bearers. Two walkyries, Hrist and Mist, are cup-bearers to Odin himself.

They differ in regard to their origin; some of them spring from elves and other superhuman beings; some also are the daughters of princes, who in their lifetime are numbered among the walkyries, showing all their qualities, and when they die, their spirits become walkyries. They ride generally in companies of three, or of three times three, or four times three, and have the gift of changing themselves into swans. They often choose noble heroes for lovers. Whoever deprives a walkyrie of her swan-robe gets her into his power. But the song of the walkyries sounds terrible, as sitting on a hill, they weave the fateful battle-web. The walkyries were frequently confounded with the norns or destinies. They were also conceived under the figure of the clouds. Thus, Hrist signifies dark sky, and Mist signifies quaking. Most of the names of the walkyries, however, relate to war and battle.

WALLABOUT BAY, in Brooklyn, in the East river, opposite the s.e. extremity of Manhattan island. The small island which divides it from the East river, and the land bordering on the bay form the Brooklyn navy-yard. During the revolutionary war the British prison-ship *Jersey* was stationed in Wallabout bay.

WALLACE, a co. in w. Kansas, having the state line of Colorado for its w. boundary; about 900 sq. m.; pop. '90, 2468, chiefly of American birth, with colored. Its surface consists of fertile prairies, part of the great plains, and is destitute of timber. It was organized in 1875. Co. seat, Sharon Springs.

WALLACE, Alfred Russel, traveler and naturalist, was b. in Monmouth, England, Jan. 8, 1822, and was educated for the profession of land-surveyor and architect, a calling he exercised until 1845, when he devoted himself exclusively to naturalistic studies and researches. He spent four years on the Amazon, and eight years amongst the Malay islands, making extensive zoological collections. It was while living in the east that, unaware of Mr. Darwin's cognate researches and speculations, Wallace formed and committed to writing a theory of development by natural selection, though not using the latter term. Valuable contributions to zoology, botany, and cognate subjects are to be found in his *Travels on the Amazon and Rio Negro* (1853); *Palm Trees of the Amazon* (1853); *The Malay Archipelago* (2d ed. 1869); *Contributions to the Theory of Natural Selection* (1870). *The Geographical Distribution of Animals* (1876) practically founded a new science. *Tropical Nature* appeared in 1878. In a work *On Miracles and Modern Spiritualism* he vindicates views that have found few champions among men of science. He published *Australasia* (1879); *Island Life* (1880); *Land Nationalization* (1882); *Australia and New Zealand* (1893), etc.

WALLACE, Horace Binney, 1817–52; b. Penn.; educated at the university of Pennsylvania and the Princeton college, where he graduated, 1835; studied medicine and law, but never practiced. He assisted Judge Hare in editing *American Leading Cases; Smith's Leading Cases;* and *White and Tudor's Leading Cases in Equity;* published a novel, *Stanley, or the Recollections of a Man of the World,* and left works on European travel and literary criticism, published posthumously. In 1852 he was attacked by brain disease and committed suicide. His brother, John William, b. Penn., 1815, also studied law; 1842–53; was reporter for the U. S. circuit court (3d circuit), and in 1864 was appointed reporter of the U. S. supreme court, which position he held till his death, 1884. He edited various collections of noted law cases.

WALLACE, Lewis, b. Ind., 1827; served through the Mexican war, and afterward practiced law in his native state, and was a state senator for four years. He was adj.-gen. of Indiana at the beginning of the war of 1861–65; was soon made brig.-gen. of volunteers, and commanded a division at fort Donelson, receiving a maj.-gen's commission for his gallantry. In 1863 he prevented the capture of Cincinnati by Gen. Kirby Smith. Taking command of the 8th army corps, he met Early marching on Washington, and was defeated by him at Monocacy in July, 1864. Gen. Ord was directed by Gen. Halleck to supersede Wallace, but the latter was promptly reinstated by Grant. Wallace had, in fact, succeeded in his object, which was to give Grant time to re-inforce Washington from City Point. He was afterward a member of the court which tried the assassins of Lincoln, and president of the court which tried Wirz of Andersonville. He was governor of New Mexico in 1878–80, and minister to Turkey, 1881–85. He published *The Fair God* (1873); *Ben-Hur* (1880); *The Boyhood of Christ* (1889); *The Prince of India* (1893), etc. His wife is known as a brilliant and picturesque writer of historical and descriptive sketches.

WALLACE, Robert, d.d., b. Scotland, 1831; educated at Geddes institution, the high school, Edinburgh, and the universities of St. Andrews and Edinburgh, graduating m.a. in the former, 1853; ordained in the Presbyterian church, and became successively minister of Newton-upon-Ayr, 1857; of Trinity college church, Edinburgh, 1860; of Old Greyfriars, Edinburgh, 1868; received degree of d.d. from the university of Glasgow, 1869; elected professor of church history in the university of Edinburgh, 1872; succeeded Dr. Russel as editor of the *Scotsman,* 1876.

WALLACE, William, the famous Scottish patriot, was the younger son of a knight of good family in the s.w. of Scotland. Neither the date nor the place of his birth has been ascertained; but there is no doubt that the former may be assigned to the middle of the reign of Alexander III. Nothing certain is known of his education or his early years. Blind Harry's half-fabulous poem has indeed inseparably associated his birth with Ellerslie, his boyhood with Dundee, and his youthful manhood with Ayrshire; but his true history, even in the next generation, was so obscure, that it is now impossible to separate truth from falsehood or exaggeration. He first appears in the light of authentic history as the chief of a band of insurgents against Edward, king of England. Taking advantage of his superior power, of his influence over the barons of Norman race, who then were the foremost persons among the nobility of Scotland, and of the position of umpire to which he had been chosen by the various claimants to the Scottish crown, Edward had established his supremacy over the northern kingdom, and afterward deposed John Baliol, and attempted to govern in his own absolute right. See Scotland, *History.* The injustice of the claim, and the cruelty with which it was enforced, roused the opposition of all classes in Scotland except the higher nobles. The gentry and the middle and lower classes of the Lowlands, had for many years identified themselves with the country in which they dwelt, rather than with the great English race from which most of them drew their descent; and what has been called the war of independence began, which resulted in the deliverance of Scotland from foreign rule, at the cost of the

comparative civilization and tranquillity which the country had enjoyed under the descendants of Malcolm Canmore. In this struggle Wallace was the most successful leader; and in the course of the year 1297 the insurrection became general. Edward himself was at that time in Flanders; but his general in Scotland, the earl of Surrey, led his army to Stirling. On Sept. 11 they encountered the Scots under Wallace, and were completely defeated. The whole kingdom submitted to Wallace; who, passing the border, ravaged Cumberland and Northumberland without opposition. On his return from this expedition he was elected by his countrymen governor of Scotland, in name of king John, whose title was still recognized. In the following year Edward in person entered Scotland at the head of a numerous army. He was met at Falkirk (q.v.) by Wallace on July 22; but the Scots were defeated. It is generally assumed that the jealousy of some Scottish nobles, who envied the position of the governor, had aided in bringing about the disaster, and Wallace, in consequence resigned his high office. With this event, his brilliant public career may be said to have terminated. All that is certainly known is that he continued to struggle for his country's independence, and never made his submission to Edward, or took those oaths of fealty to him which were so lightly made by the Scottish nobles, and as recklessly broken. The events of this period related by modern writers under the name of "Lives of Wallace," are either transactions in which there is no evidence that he took any part, or the doubtful legends which, as years went on, gathered round the name of the Scottish hero. Some documents of undoubted authenticity make it probable that he was for some time in France. The close of his life forms an exception to this obscurity. When Edward offered pardon to the other Scottish leaders on certain terms, Wallace was excepted by name. If he chose to surrender, he might do so, but it was to be without conditions, and his life was to be at the king's mercy. Efforts were also made to discover his retreat and secure his person, and these were finally successful. In the year 1305 he was seized by some of his own countrymen, and delivered to Edward. He was carried to London, and with a mockery of the forms of justice, tried for treason. He denied the charge, asserting, with truth, that he had never been the vassal or subject of Edward; but his plea was disregarded. He was condemned and executed on Aug. 23; and his death was accompanied by acts of barbarity uncommon even in that age, and marking the merciless character which distinguished the later years of the English king. Contradictory as are the accounts of the English and Scottish chroniclers, it is not difficult to discover the true character of Wallace. He was the true leader of a national insurrection against a foreign yoke. The cruelties inflicted in his invasion of England are undeniable, but he did what he could to mitigate them; and he should not be severely blamed if, under far greater provocation, he tolerated what the good king David, in his war of the standard, was unable to prevent. His memory lives, and will ever live in the hearts of his countrymen, who know that they owe to him and to those who followed in the same course, that their history has not been as unhappy as the history of Ireland. The chief authority for the life of Wallace, as told by popular Scotch writers, is the poem of Henry the minstrel, who lived, however, nearly two centuries after his hero, and whose narrative is an almost unbroken series of picturesque impossibilities. The fullest modern account is that given by Mr. Tytler in the first volume of his *History of Scotland,* and in his Life of Wallace in the first volume of his *Scottish Worthies:* but Tytler is to a large extent *Blind Harry* over again, with judicious excisions.

WALLACE, William A., b. Huntingdon co., Penn., 1827; received an academic education and was admitted to the bar, 1847; was a state senator, 1862–75, and speaker of the senate in 1871; chairman of the democratic state committee for five years; member of the commission to suggest amendments to the state constitution, 1874; U. S. senator, 1875–81; and again elected to the state senate, 1882. He d. in 1896.

WALLACE, William Vincent, a British musician and composer of operas, was born at Waterford of Scotch parents, June 1, 1814. He early attained proficiency as a performer on the pianoforte and violin—his performances on the latter instrument bringing him under the notice of Paganini. After being for some years leader of the orchestra of a Dublin theater, he emigrated to Australia, where he lived for a considerable time in the bush, and then suddenly appeared in Sydney as a musician, and gave concerts in Australia, New Zealand, India, and America. In 1845 he came to England, and wrote his first opera, *Maritana,* which was an immediate success both in London and Vienna, and still holds the stage as one of the most popular of English operas. *Matilda of Hungary* followed in 1847. During a sojourn of some years in Germany, Wallace added further to his musical culture; and after again visiting America, composed *Lurline,* which was brought out in London in 1860, with even greater success than *Maritana.* In 1861 he produced *The Amber Witch;* in 1862, *Love's Triumph;* and in 1863, *The Desert Flower.* Wallace died at the château de Bagen, in the s. of France, Oct. 12, 1865, leaving another opera, *Estrella,* nearly completed. Without possessing genius of the very first order, Wallace was a highly-cultivated musician; the freshness of the motives, and the brilliancy of the orchestration of his operas, particularly *Maritana* and *Lurline,* have stamped their author as one of the chief English composers of this century.

WALLACH'IA. See Moldavia.

WALLACK, James William, 1795–1864; b. London; played at Drury Lane theater with Edmund Kean in Shakespearean parts. He came to New York in 1818, making his appearance at the Park theater as Macbeth the same year. He assumed the management of Drury Lane theater in 1820; opened the National theater, New York, in 1837; and Wallack's lyceum, afterward called Wallack's theater, at the corner of Broome street and Broadway, in 1852; it was rebuilt at Broadway and 13th street in 1861, and afterwards rebuilt at Broadway and 30th street. He was an excellent comedian.

WALLACK, John Lester, b. New York, 1820; son of James William. He was the proprietor of Wallack's theatre (see Wallack, James William), and was long known as one of the most finished actors on the American stage. He d. 1888.

WALLA WALLA, a co. in s.e. Washington. In 1875 the new county of Columbia was formed from its e. portion; 1296 sq.m.; pop. 1890, 12,224. Co. seat, Walla Walla.

WALLA WALLA, city and co. seat of Walla Walla co., Wash.; on Mill creek and the Washington and Columbia river and the Oregon Railroad and Navigation Co.'s railroads; 245 miles e. by n. of Portland, Or. It was incorporated as a town in 1859 and as a city in 1862; is the seat of Whitman college (Cong.), the U. S. military post of Fort Walla Walla, a U .S. penitentiary, and the state penitentiary; and contains Roman Catholic and co. hospitals, Paine high school, Baker public school, Park school, St. Vincent's academy for girls, St. Patrick's school for boys, street railroads, gas and electric light plants, gravity system of waterworks supplied from springs, national and private banks, and daily and weekly newspapers. Pop. '90, 4709.

WALLENSTEIN (or, more correctly, **WALDSTEIN**), Albert Wenceslas Eusebius von, Duke of Friedland, Sagan, and Mecklenburg, the most remarkable of the long series of eminent men who owe their prominence on history's page to the thirty years' war, was the third son of a noble though not wealthy Bohemian family, and was born at the château of Hermancè, in Bohemia, Sept. 15, 1583. His parents, who were Protestants, intrusted the care of his education to the Moravian brotherhood of Koschumberg, who, however, made little of their stubborn and passionate pupil. On his parents' death, his uncle, Albert Slavata, a zealous Catholic, took charge of the wayward youth, and having won him over to his own creed, sent him to the Jesuit *convictorium* at Olmütz, and to the universities of Altorf, Bologna, and Padua, where his education, such as it was, was completed. Wallenstein's course of training had not eradicated, or even moderated, the prominent faults in his natural disposition; on the contrary, his wilfulness and independent spirit had gathered stability and strength from ineffective opposition; and his first prominent appearance on the stage of events showed a man of extreme individuality, gifted with great and versatile ability, but equally remarkable for obstinacy, passion, and pride. He afterward visited Germany, France, and Holland, took service in the imperial army, then engaged with the Turks in Hungary, and, returning home at the close of the war (1606), married an aged widow of noble rank, who, at her death (1614), left him the whole of her great wealth. This, along with the fourteen domains bequeathed to him by his uncle, made him one of the richest and most influential lords of Bohemia, a position recognized by the imperial court by the bestowal on him of the title of count and the military grade of col. A second marriage in 1617 with the daughter of count Harrach, the emperor's favorite, and Wallenstein's firm adherence to the imperial side during the Bohemian insurrection; his maintenance, at his own expense, of a large body of troops; and his brilliant and well-directed gallantry at the battle of Prague, and in various contests with Mansfeld and Bethlem Gabor, added a powerful influence at court to his hitherto only local eminence. The latter, however, was now much increased by his purchase, at much less than their value, of sixty confiscated lordships in Bohemia; and Ferdinand II. felt himself impelled to recompense the valuable services of his faithful subject by (1623) raising him to the dignity of a prince of the empire, with the title of *duke of Friedland.* (Friedland is a town situated close to the Prussian frontier, about 60 m. n.n.e. of Prague.) Two years after, when the impossibility of maintaining an army sufficient to restrain the Protestant league from uniting with the Danes against him, threw the emperor almost into despair. Wallenstein, seizing such a favorable opportunity of gratifying his ambition, offered to raise, equip, and maintain 50,000 men free of charge, provided he were intrusted with the absolute command, and allowed to appoint his own officers: a proposal greedily accepted by the emperor. Wallenstein raised 30,000 in Bohemia; adventurers from all quarters flocked to his standard; and in a short time his army far exceeded the promised number. With this motley but not ill-disciplined array, he then marched into North Germany, and acting in concert with Tilly (q.v.), routed Mansfeld at Dessau, hunted him through Silesia and Moravia, and on his junction with the army of Bethlem Gabor in Hungary, compelled, by skillful strategy, the combined forces to remain on the defensive. Released by a truce with the Transylvanian prince and the death of Mansfeld, he returned by Silesia, recovered the fortresses which Thurn had captured, forced the elector of Brandenburg to submit to the emperor, and joined Tilly in annihilating the military power of Denmark. The value of these services to the emperor's cause was inestimable, as Ferdinand well knew, and he accordingly turned a deaf ear to the loud complaints of the

North Germans, who had suffered grievously from the rapacity, oppression, and license which Wallenstein's soldiers were allowed to exercise without the slightest opposition; and rewarded their leader by the gift of the Mecklenburg duchies, the rank of general issimo on land, and admiral of the Baltic. Wallenstein speedily made himself master of his new territory; fitted out a fleet of 15 sail, by the aid of which he captured Usedom and Rugen, with various Baltic ports, and laid siege to Stralsund. But the Danes annihilated his navy; and the Swedes succoured Stralsund, the siege of which he abandoned in despair. But as under cover of the dread inspired by Wallenstein's arms, Ferdinand had resumed his tyrannical and aggressive schemes (see THIRTY YEARS' WAR) in Germany, the Catholic league, headed by the duke of Bavaria, became bitter adversaries of Wallenstin, and backed by the intrigues of France (which was represented at Vienna by father Joseph, a master of subtle and unscrupulous diplomacy), partly forced and partly cajoled the emperor to dismiss Wallenstein, an act for the probable consequences of which even Ferdinand, with his extraordinary fortitude, trembled. Wallenstein, however, disappointed his sovereign's fears and his enemies' hopes by obeying with apparent cheerfulness, being somewhat moved thereto by the predictions of his favorite astrologer,* who declared his star to be only temporarily eclipsed and that it would soon shine forth again with far greater luster; and retired to Prague, where he lived in his magnificent palace in sovereign state, surrounded by a court composed of barons, knights, and the principal officers of his army. But the insult and injury he had received were eating into his soul; the frankness and affability to his subordinates, which had hitherto distinguished him, were changed for a gloomy taciturnity; and much of his time was spent in solitude, brooding over his wrongs, and scheming for revenge on the duke of Bavaria, whom he justly accused of being the cause of his disgrace; though all the while he kept a calm but eager watch over the changes of opinion in the court of Vienna, where several of the ministers and numerous secret agents were either in his pay, or devoted to his interests. His eminent services, his immense popularity, and his great talents, pointed him out as the only hope of the empire after Tilly's death, and Ferdinand saw himself forced almost to kneel to his haughty subject, and beseech him again to gird on his sword; but Wallenstein for a long time affected the utmost indifference to re-engaging in active service, and at last consented only on such conditions as made him the independent ruler of the empire in military affairs. With the Swedes on the Danube, the Saxons in Bohemia, and the army of the League almost annihilated, the emperor had no choice; and Wallenstein, three months afterward, was at the head of 40,000 men, well armed and disciplined. But commands and entreaties were in vain employed to induce him to save Bavaria from the Swedes; and he lay idle at Leitmeritz, gloating over the pangs of his enemy, till, on Austria being threatened, he advanced to Eger, and by menacing at once Saxony and Nuremberg, brought Gustavus to a stand-still. The two armies lay opposite each other for 10 weeks, each suffering the extremities of famine, hardship, and sickness, in the hope of wearying out the other. At last, when half their numbers had succumbed, Gustavus, who had made a fruitless attempt to storm Wallenstein's camp, retreated to the Danube, whence his skillful opponent soon drew him by marching on Saxony. The two again confronted each other at Lutzen (q.v.), and though Wallenstein was completely defeated, it was chiefly owing to the superior discipline and *morale* of his opponents. His army was recruited and reorganized in Bohemia; and, unable to make head against Saxons and Swedes combined, he found it advisable to gain time by amusing his antagonists with illusory negotiations, after repeated vain endeavors to persuade the emperor to come to terms with the Protestant princes. Meantime his old enemies of the league were in full activity at Vienna; and the emperor, chagrined at the humiliations to which he had subjected himself to gain Wallenstein's aid, was not slow to give credit, real or feigned, to their misrepresentations; his ill-concealed dislike was developed into hatred by the stubborn pertinacity with which Wallenstein insisted on the full observance of the terms of their agreement; and on Wallenstein, who was kept well informed of the state of matters at court, attempting to attach his officers permanently to himself by obtaining their signatures (Jan. 12) to an agreement to that effect, the emperor (Jan. 24, 1634) declared him a rebel, and ordered two of his old officers, Piccolomini and Gallas, who had for some time been acting as spies on his actions, to take him dead or alive. Wallenstein, with some devoted adherents, including a guard of 200 dragoons, took refuge in Eger, but was there assassinated, Feb. 25, 1634. Wallenstein was tall, thin, and wiry, with lively brilliant eyes, tawny-reddish hair, and an unhealthy-looking, yellow complexion. "He was far superior to his sovereign in true policy, liberality of sentiment, and religious toleration; but these qualities only rendered him more obnoxious to the bigoted emperor and his ministers. As a general, he holds the foremost rank, vigilance and presence of mind, great judgment and unflinching perseverance, being his prominent characteristics; and of him alone can it be said that he checked the progress and foiled the designs of the great hero of Sweden. After his death, it was seen that the treacherous murder of one who had twice saved the empire from destruction called for some justification; and accord-

* Wallenstein, during his attendance at the Italian universities, had deeply studied astrology; and although far too much has been made of this fact by his biographers, there is no doubt that the mystic doctrines of this pseudo-science had a strong hold on his mind, and at times much influenced his conduct.

ingly a paper was published by imperial authority, in which an attempt was made, by misrepresenting every overture he had made to his opponents, and every scheme he had employed to divide his numerous enemies at court, to prove that he had constantly meditated treason from the time of his first disgrace. This view and its opposite have found numerous and enthusiastic supporters; but without going further into detail, we may observe that the overtures made by him to the Swedes and Saxons while in command were undoubtedly *ruses de guerre*, and were invariably found to be such by his opponents; that when the Saxons invaded Bohemia, and took Prague, where he was residing in disgrace at the time, he took no part on either side, except such measures as an influential citizen would adopt for the safety of the inhabitants from insult and spoliation; and lastly, that when, after he had been declared a rebel, he *did* make "treasonable" overtures to Bernhard of Weimer, the latter, though Wallenstein's defection would at that time have been of the utmost importance, could not convince himself that this was not another artifice; a proof that the former overtures were as above stated.—See Coxe's *House of Austria;* Harte's *History of the Life of Gustavus Adolphus* (1759); Pelzel's *Geschichte der Böhmen* (Prague, 1774, 1779, and 1782); *Wallenstein's Briefe* (ed. by Forster, 1826); Ranke's *Geschichte Wallenstein's* (1869); Gindely, *Neues über Wallenstein.*

WALLER, a co. in s.e. Texas, bounded on the w. by the Brazos river; 500 sq.m.; pop. '90, 10,888. Co. seat, Hempstead.

WALLER, Edmund, celebrated as one of the refiners of English poetry, was b. at Coleshill, Herts, March 3, 1605 or 1606. He was of an ancient and opulent family, and having passed through Eton and King's college, Cambridge, was returned to parliament, at the early age of 18, as member for Amersham, Bucks. In 1631 he married a London heiress, who died shortly afterward; and the rich widower made suit to lady Dorothy Sidney, eldest daughter of the earl of Leicester, whom he poetically and perseveringly commemorated under the name of Saccharissa. Lady Dorothy, however, was inexorable: "she was not to be subdued," as Johnson says, "by the powers of verse." Meeting him in her old age, she asked the poet when he would again write verses upon her, and he ungallantly replied: "When you are as young, madam, and as handsome as you were then." In the long parliament, Waller joined the party of Hampden (who was his cousin), and he was one of the commissioners appointed to negotiate with king Charles I. at Oxford in 1642. He was soon gained over by the royalists, and entered into a conspiracy against the dominant party in the house of commons, for which he was fined £10,000, and banished the kingdom. His conduct on this occasion was mean and disgraceful. He not only confessed all he knew, but all that he suspected; attempted to criminate innocent persons, and humbled himself before the house of commons in language inexpressibly abject and humiliating. After eight years' exile, spent in France and Italy, he was suffered to return to England; and he then became a supporter of the commonwealth, and a panegyrist of Cromwell, to whom he was distantly related. When Charles II. was restored, Waller was equally ready with a poetical congratulation; but his loyal strains were much inferior to those with which he had hailed the protector; and it is said that when Charles reminded him of this fact, the poet wittily replied: "Poets, sir, succeed better in fiction than in truth." Up to his 80th year, Waller continued a member of the house of commons, delighting all parties by his wit and vivacity. He died at Beaconsfield, Oct. 21, 1687. Waller began early to write verses, and published two collections of his poems—one in 1645, and another in 1664. An edition appeared in 1711, edited by Atterbury; and one in 1729, with copious "Observations" by Fenton. Pope has eulogized the *sweetness* of Waller's verse.

WALLER, Edwin, b. Va., 1800; removed to Texas, where he was made alcalde. The *Sabine*, a vessel belonging to him, carrying cotton on which the Mexican government had laid a duty, evaded its payment; Waller was imprisoned. On his release he brought back 2 cannons, which were of use in the war that ensued, and in which Waller was active. He helped to frame the constitution of Texas, was the first mayor of Austin, and chief justice of Austin county. He selected Austin as the site for the capital.

WALLER, Thomas M. (Armstrong), b. New York, abt. 1840. He began life as an orphan newsboy in New York; drifted to Conn., where he was adopted by the late Robert K. Waller, of New London, whose surname he assumed. He attended the New London high school, studied law, and gained a high reputation in his profession; was a member of the state legislature for several terms; secretary of state, 1870; mayor of New London for six years; state attorney, 1876–83; democratic governor of Connecticut, 1882–85; and U. S. consul-general at London, 1885–89.

WALLETTE, a former co. in w. N. Dakota, having the Missouri river for its s. boundary; now included in Williams co.

WALLFLOWER, *Cheiranthus*, a genus of plants of the natural order *cruciferæ*, having the siliques quadrangular from the prominence of the nerves on the back of the valves, the seeds in a single row in each cell, the stigma deeply 2-lobed, the lobes bent back. The flowers are in racemes. The species are annual, biennial, or perennial herbaceous plants, some of them almost shrubs. The Common W. (*C. cheiri*) is found in rocky places and on old walls in the s. of Europe, and also, but less abundantly, in the middle of Europe and in Britain. In its wild state, its flowers are always yellow; but

in cultivation they exhibit a considerable diversity of colors, chiefly brown, purple, and variegated; and they attain a larger size. It is a universal favorite, on account of the delicious odor of its flowers. The varieties in cultivation are very numerous; but there are among them no marked distinctions. Double and semi-double flowers are not uncommon. The plant is perennial, but in gardens is generally treated as a biennial, although fine kinds are propagated by cuttings, which soon strike root under a hand-glass.

WALLING, George Washington, b. N. J., 1823, studied law, but in 1842 the death of his father changed his plans and he became a steamboat engineer. He served in that position on a revenue cutter during the Mexican war, and at its close became a police officer in New York city. In 1853 he was promoted to the grade of captain, and in 1866, inspector, in which capacity he greatly strengthened the efficiency of the force. In 1874 he became superintendent of the force, and in 1885 was retired on a pension. He d. in 1891.

WALLINGFORD, a town and borough in New Haven co., Conn.; on the Quinepiac river and the New York, New Haven, and Hartford railroad; borough 12 miles n. of New Haven. Besides the borough, the town contains the villages of East Wallingford, Yalesville, and Tracy. There are three high schools, nearly a dozen district schools, public and Simpson libraries, Rosemary hall (P. E.), the State Masonic home, national and savings banks, electric street railroad, a trotting park, and manufactories of silver-plated and light brass goods, rubber goods, wheels, etc. Pop. '90, town, 6584; borough, 4230.

WALLINGFORD, a small, but ancient and interesting, municipal borough of England, in the county of Berks, and on the right bank of the Thames, 13 m. n.n.w. of Reading. Pop. '91, 2989.

WALLIS, Rev. John, d.d., a very eminent English mathematician, was the eldest son of the Rev. John Wallis. incumbent of Ashford in Kent, and was born there, Nov. 23, 1616. He was brought up with a view to the church, and was educated for his profession, to the strict exclusion of all other branches of knowledge, in accordance with the prevailing practice of the time, which was in his case carried to such an extent that even ordinary arithmetic was wholly neglected. Wallis never saw a book of arithmetic till he was 15 years old, and then only by accident. At the age of 16, he was entered at Emmanuel college, Cambridge, where at that time mathematics found no place in the course of study, being esteemed merely mechanical. After a brilliant career, he took his degree, was chosen a fellow of queen's, and took orders in 1640. On the outbreak of the civil war, he sided with the parliament, and was of great use to his party in deciphering intercepted correspondence, an art in which like Vieta (q.v.) and Battista la Porta, he was eminent. In 1644, he was one of the secretaries of the assembly of divines at Westminster, holding at that time the living of St. Gabriel, Fenchurch street; and, in the following year, he joined with other eminent men in the establishment of the meetings for mutual instruction, which, 17 years afterward, developed into the royal society. It was not till 1647 that he commenced the study of mathematics; and, in 1648, he was chosen Savilian professor of geometry at Oxford. The rapid progress he had made in his mathematical studies was evidenced by the publication of his greatest work, the *Arithmetica Infinitorum*, with a treatise on conic sections prefixed, in 1655. In the same year commenced his well-known controversy with Hobbes—regarding a quadrature of the circle, which the latter believed he had effected—which was continued at intervals till 1663, and was marked by the usual quaint caustic satire of the time. Wallis had, of course, the right side of the dispute; but unfortunately for posterity, his manly feeling of forbearance toward a deceased antagonist (Hobbes died in 1679) prevented him from admitting his polemical treatises into the collection of his works, which was published 1693–99. Numerous other mathematical works, as the *Mathesis Universalis* (1657), *Commercium Epistolicum* (1658), *Cuno-Cuneus* (1663), *De Proportionibus* (1663), *De Æstu Maris* (1668), a treatise on mechanics (1669, 1670, 1671), editions of the works of Horrocks (1673), of the arenarius and quadrature of Archimedes (1676), and of Ptolemy's harmonics (1680), a treatise on algebra (1685), an edition of Aristarchus and of Pappus (1688), etc., were the products of his originality and industry. We have besides numerous minor theological works, polemical and expository, from his pen, none of which, however, are important enough to call for mention. Of his other works, the treatise on logic (1687) is of the highest excellence, and even at the present day is well worthy of perusal; and his English grammar (1653), written in Latin for the use of foreigners, has only of recent years, when the true principles of grammar are becoming better understood, received the attention it merits. About 1658, Wallis joined the party who were in favor of a restoration of kingly government, and his talent for deciphering was now put in practice against his former friends, an act for which he has been abused with virulent injustice. At the restoration he was confirmed in his professorship, was appointed keeper of the archives at Oxford, and royal chaplain. In 1692, he was consulted as to the adoption of the Gregorian calendar, and his strong disapproval decided the government to retain the old style. He died Oct. 28, 1703.

It is exclusively as a mathematician that Wallis's name has obtained permanently a niche in the temple of fame; though as an expositor of the cardinal doctrines of Christianity he was fully on a par with South and Sherlock; but his eminence in the former

character has thrown into shade even his services as a scholar, and few at the present time remember that it was he who first edited the musical works of Ptolemy, Porphyrius, Aristarchus of Samos, and the later work of Briennius, though the manner in which these labors were effected indicates unquestionably an immense expenditure of labor, and a high degree of scholarship. His *Arithmetica Infinitorum* is a successful attempt to solve, by means of the summation of series to infinity, a number of the more simple problems of the calculus, such as the evaluation of all cases of $\int x^m dx$; and, in extension, to discover the limit of $\int (a^2 - x^2)^n dx$, of which the quadrature of the circle is a particular case. There are numerous other results, which are, at the present time, considered to belong to the more advanced stages of the calculus; and, in fact, Wallis is another example of the strange blindness which, in full possession of a principle, neglects to suit it with a generalized form of expression. The best known of Wallis's results is his formula for π, which gives

$$\frac{\pi}{4} = \frac{2.4.4.6.6.8....}{3.3.5.5.7.7....} \text{ ad infinitum.}$$

WALLIS, Severn Teackle, b. Md., 1816; graduated at St. Mary's college, Baltimore, 1832; studied law and was admitted to the bar, 1837. Since 1870 he has been provost of the Maryland university, and is a trustee of the Peabody institute of Baltimore. He has published *Glimpses of Spain* (1849); and, *Spain, her Institutions, Politics and Public Men* (1853).

WALLON, Henri Alexandre, b. France, 1812; educated at the Paris normal school. In 1840 he was appointed professor at the Sorbonne, and gave lectures on geography and history. In 1871 he was elected to the national assembly as a moderate conservative. In 1875 he became minister of public instruction in the Buffet administration. He proposed the clause by which the republic was constitutionally established. In 1876 he was elected to the senate. Among his works are *La vie de Jésus et son nouvel historien* (1864), answering Renan; *La Terreur* (1872); and *Les Représentants du Peuple en l'An II.* (1888–90).

WALLOONS, the name given to a population belonging to the great Romanic family, more especially to the French stock, and occupying the tract along the frontiers of the German-speaking territory in the South Netherlands, from Dunkirk to Malmedy. They are located more particularly in the Ardennes, in parts of the departments of Pas-de-Calais, Nord, Aisne, and Ardennes in France, but chiefly in South Brabant, as well as in the provinces of Hainault, Namur, Liége in Belgium, and in the greater part of Luxemburg, and finally in some towns and villages in the neighborhood of Malmedy in Rhenish Prussia. The Walloons, whose numbers in Belgium, where they are principally established, are stated at 2 millions, are the descendants of the old Gallic Belgæ, who held their ground among the Ardennes mountains when the rest of Gaul was overrun by the German conquerors, but became eventually Romanized, especially in their language, which appears now as a patois or popular dialect of French; of all the French dialects, however, the greatest number of Gallic words have been preserved in it. See the unfinished work by Grandgagnage, *Dictionnaire Etymologique de la Langue Wallone* (Liége, 1845). The name Walloon, in Dutch, *Walen*, sufficiently shows their Gallo-Romanic origin, and their relationship, partly by race and partly by language, with the Galli, Gaels, Walese, Welsh, Walachians, etc. The Walloons of the present day resemble their French more than they do their German neighbors. They are squat and middle-sized, with powerful limbs, dark hair, deep sunk, fiery, dark-brown or blue eyes. They surpass their Flemish neighbors in adroitness, activity, and skill; and their French in earnestness, perseverance, and diligence. In impulsiveness, they resemble the latter more than the former, but their anger sooner cools than that of the more deeply feeling Fleming. It is worthy of notice that the Belgian revolution was pre-eminently the work of the Walloon districts, and the most eminent statesmen of modern Belgium are of Walloon descent. It was against the Walloon spirit and tendencies that the Flemish movement (see Flemish Language and Literature) was chiefly directed.

WALL-PAPER. See Paper-Hangings.

WALL-PIECE, a small cannon (or, in ancient times, an arquebus) mounted on a swivel, on the wall of a fortress, for the purpose of being fired at short-range on assailants in the ditch or on the covert-way. There are distinct evidences that the great wall of China was originally constructed for the reception of wall-pieces.

WALL-PLATE, a piece of wood laid along the top of the wall of a building to receive the feet of the rafters of the roof (q.v.).

WALLSEND, a t. in the co. of Northumberland, England, 4 m. e.n.e. from Newcastle, celebrated for its collieries. Pop. 91, 11,620.

WALL-TREES, in horticulture, are fruit-trees trained on walls for better exposure of the fruit to sunshine, and for the heat radiated from the wall. Brick walls are generally preferred, and have a great advantage in the regularity with which the nailing can be

accomplished, but trees are often also trained on stone walls, and the walls of houses are sometimes used for this purpose. Trees are trained on walls in hot-houses as well as in the open air. Flued walls are often used, the fruit being thus partially forced by artificial heat; and screens of various kinds, as of reeds, canvas, and oiled paper, are sometimes employed to protect blossoms in spring. Woollen nets are also much used for this purpose, and a net even with wide meshes affords much protection from spring frosts. Wall-trees, intended permanently to occupy the wall, are generally trained in the nursery with a dwarf stem only 5 or 6 in. in length, so that the branches may cover the whole wall, and no available part of it may be lost. It is usual, however, in planting to introduce *riders* alternately with the permanent wall-trees, which are grafted or budded on tall stocks, and occupy part of the wall till the other trees have become large enough to require it all for themselves. Garden-walls are generally 12 or 14 ft. in height. Different modes of training wall-trees are practiced, of which the principal are known as *fan training* and *horizontal training*. In the former, the branches are arranged like the spokes of a fan; in the latter, a main stem is led up, from which they are spread out horizontally on both sides. Different modes are preferred for different kinds of trees, and the art of the gardener is dispayed in keeping to his plan of training, and *laying in* branches so as completely to fill up the space, and make every part of the wall productive. There is a Dutch mode of training, which consists in leading two chief branches horizontally to right and left, and training shoots from them straight up to the top of the wall. It is seldom employed in America, except for white currants. Riders are not unfrequently trained in a star-like form, some branches being led downward, in order to fill the wall as quickly as possible. It is necessary for the gardener in training wall-trees, to consider the habit of each kind, particularly whether fruit is chiefly to be expected on young branches or on the *spurs* of older branches. Superfluous branches must in all cases be carefully removed, and among these are to be reckoned all *fore-right shoots*, or branches which project straight from the wall. The use of small strands of cloth along with nails, to fasten branches to walls, is familiar to every one. These strands are renewed from year to year, so that they may not cause disease by interfering with the growth of the branches.

WALNUT, *Juglans*, a genus of beautiful trees of the natural order *juglandaceæ*. This order is nearly allied to *amentaceæ* (q.v.), and particularly to the sub-order *cupuliferæ* (q.v.) or *corylaceæ*, but differs in having the ovary one-celled, with a solitary erect ovule. The flowers are unisexual, the male flowers in catkins, the female in terminal clusters. The species, of which not quite thirty are known, are mostly natives of North America; a few are found in Asia. All are trees with alternate pinnated leaves. The genus *juglans* is distinguished by monœcious flowers, with 18 to 24 stamens; and a drupe with a deciduous fleshy husk, which bursts irregularly, and a deeply wrinkled shell (*putamen*) of two valves, within which is the seed, curiously lobed and wrinkled, with a membranaceous *testa* and partial dissepiments. The species of hickory (q.v.) were formerly included in this genus.—The Common Walnut (*J. regia*) is a native of Persia and the Himalaya, but has long been cultivated in all parts of the s. of Europe. The date of its introduction is unknown, but it was certainly cultivated by the Romans in the reign of Tiberius. It is a lofty tree of 60 to 90 ft., with large spreading branches. Its foliage resembles that of the ash. The leaves have 2 to 4 pair of leaflets and a terminal one. They have a fine balsamic odor when bruised; this quality, however, being much more marked in some trees than in others. An infusion of them has been found useful in scrofula; and when bruised and rubbed on the skin they are efficacious in curing itch. Placed in wardrobes, they prevent the ravages of moths. The sap is limpid like water, but contains much sugar, so that the tree is sometimes tapped for it like the sugar-maple, and the sugar is procured by evaporation. A pleasant kind of wine is also made from it. An excellent pickle and a kind of ketchup are made of the unripe fruit. The ripe fruit is one of the best of nuts, and is an important article of export from many parts of the s. of Europe. Walnuts are also exported in large quantities from Cashmere and other Himalayan regions to supply the markets of India. The outer husk is removed before the nuts are brought to market. In the s. of Europe walnuts are a very considerable article of food, and when perfectly fresh they are wholesome and nutritious, although in the state in which they are imported into Britain they are not easily digestible. Just before they are ripe they are much used in France with vinegar, salt, pepper, and shallots. Among the varieties of walnut in cultivation is one with a very thin shell, which is much esteemed. Walnuts yield by expression a bland fixed oil, which under the names of *walnut oil* and *nut oil*, is much used by painters, and in the countries in which it is produced is a common article of food. The *cake* left after the expression of the oil is sometimes used as an article of food, and is also used for feeding cattle and poultry. The timber of the walnut is of great value, and is much used by cabinet-makers. Gun-stocks are made of it. It is light, although hard and fine-grained. The wood of young trees is white and little esteemed; that of old trees is brown, veined and shaded with darker brown and black. The wood of the roots is beautifully veined. Both the root and the husks of the walnut yield a dye, which is used for staining light-colored woods brown. The walnut, when meant to become a timber-tree, is best sown where it is to remain, as the roots are much injured by transplanting. The best kinds of

walnut for fruit are generally grafted. The walnut succeeds well in Britain as an ornamental tree, even in the n. of Scotland, although it seldom quite ripens its fruit except in the warmest parts of England. It was probably brought to England by the Romans. It takes its name from being foreign (A.-S. *wealh* or *walh*).—Very similar to the common walnut is the BLACK WALNUT (*J. nigra*) of North America, found in most parts of the United States except the most northern. It is a very large and beautiful tree, the trunk sometimes 6 or 7 ft. in diameter. The leaves have more numerous leaflets than those of the common walnut. The timber is even more valuable than that of the common walnut, and is used for the same purposes. The fruit, however, is very inferior, although it is sold in the markets of American cities. The partial dissepiments of the kernel are thick and woody.—The BUTTER NUT (*J. cinerea*) is abundant in the northern and northwestern states of North America, and in Canada. It is a tree only about 50 ft. high, with trunk about a foot in diameter; leaves with 15 to 17 leaflets; the fruit elongated, and externally covered with a viscid substance. The nut is hard and rough, with prominent ridges, of good quality, and sometimes brought to market in America. The wood is not apt to split or warp, and is useful for many purposes. Sugar is obtained from the sap, as from that of the maple, but is of inferior quality. The inner bark is a mild cathartic resembling rhubarb in its properties. The leaves reduced to powder are used for blistering, like cantharides.—To the natural order *juglandaceæ* belongs the genus *engelhardtia*, found in the Malayan archipelago and the Himalaya. The wood of *E. Roxburghiana*, a Himalayan species, is much valued by turners.

WALPOLE, HORACE, third son of sir Robert Walpole, fourth earl of Orford, was born in 1717. He was educated at Eton and Cambridge. After finishing his education, he traveled abroad for some years, principally in Italy, where he seems to have acquired those tastes for which he afterward became so well known. In 1741 he returned to England, and took his seat in parliament. But he had no taste for politics, and never took any active part in public life. In 1747 he purchased a piece of ground near Twickenham. Here he built his famous mansion—Strawberry Hill. Its erection and decoration may almost be said to have formed the principal occupation of his long life. In 1758 he published his *Catalogue of Royal and Noble Authors*. This was followed by *The Castle of Otranto; The Mysterious Mother;* and the *Historic Doubts on the Life and Reign of Richard III.* The works, however, to which he owes the preservation of his name are his *Letters*. These will always be interesting as pictures and records of the society and fashionable gossip of his day. Their interest is, however, considerably marred by their palpable want of truthfulness. On the death of his nephew in 1791 he became fourth earl of Orford. He died in his 80th year on March 2, 1797. "The faults of Horace Walpole's head and heart," says Macaulay, "are indeed sufficiently glaring. His writings, it is true, rank as high among the delicacies of intellectual epicures as the Strasburg pie among the dishes described in *Almanach des Gourmands*. But as the *pâté de foie gras* owes its excellence to the diseases of the wretched animal which furnishes it, and would be good for nothing if it were not made of livers preternaturally swollen, so none but an unhealthy and disorganized mind could have produced such literary luxuries as the works of Walpole. . . . . The conformation of his mind was such that whatever was little seemed to him great, and whatever was great seemed to him little. Serious business was a trifle to him, and trifles were his serious business."—See *Letters*, edited by Cunningham (8 vols., 1857); Macaulay's Essay on *Letters of Horace Walpole;* Seeley's *Horace W. and his World*, 1883. ; Dobson, *Horace Walpole* (1890).

WALPOLE, Sir ROBERT, third son of Robert Walpole, M.P., by Mary, daughter of sir Jeffrey Burwell, was born Aug. 26, 1676, at Houghton, in Norfolk. He received his education at Eton and at King's college, Cambridge. On July 30, 1700, he married Catharine, daughter of sir John Shorter, lord mayor of London. On Nov. 28 following, he succeeded to the family estates on the death of his father. In 1702 he was elected member of parliament for King's Lynn; and in 1705 he was nominated one of the council to prince George of Denmark. In this latter capacity he appears to have won the esteem of Godolphin, Marlborough, and other whig leaders. In 1707 he was appointed secretary at war; and in 1709 treasurer of the navy. Shortly after this, however, his fortunes suffered a temporary eclipse. He was found guilty by the house of commons of "a high breach of trust and notorious corruption," and accordingly, on Jan. 17, 1712, he was expelled the house, and sent to the tower. There can be little doubt that he had all his life a profound faith in bribery, and never scrupled to exercise it; but his punishment on this occasion seems rather to have been the result of party animosity than of virtuous indignation on the part of the house. He had all along been a strong Hanoverian, and on the accession of George I. he was restored to fortune. He was made a privy councilor, and had various other high offices conferred upon him. On the impeachment of Bolingbroke and others by his means, he became, in 1715, chancellor of the exchequer, and first lord of the treasury. A disunion of the cabinet having arisen in 1717, he resigned office, bringing in a sinking-fund bill on the day of his resignation. In opposition, he was the determined enemy of the South sea scheme. He was recalled to office on the retirement of the earl of Sunderland in 1721; and from this time to his final retirement in 1742, the life of Walpole may be said to be the history of England. In 1723 his son was created baron Walpole

In 1737 his power was a good deal shaken by the disputes which had arisen between the king and the prince of Wales; the latter siding with the opposition, which began to grow very formidable in the questions which arose about this time between England and Spain. Walpole was opposed to war; the grand principle of his action being, according to archdeacon Coxe, "the love of peace;" according to Macaulay, however, his aim was not the peace of his country, but of his own administration. In 1740 a motion was made in the house to petition the king to remove sir Robert Walpole "from his majesty's presence and counsels forever." This motion was negatived by a large majority; but the power of the great minister was evidently shaken. He resigned on Feb. 2, 1742, when he was created earl of Orford, with a pension of £4,000 a year. Charges of bribery were now brought against him, and a committee of investigation was ultimately appointed by the house of commons. It consisted of 21 members, of whom only two were of his own party. The report was against him, but it was unsupported by evidence, and proceedings were ultimately dropped. The rest of Walpole's life was spent in tranquillity and retirement. He died in 1745, aged 68. In private life he was amiable and good-tempered. Love of power appears to have been his ruling motive of action. He had strong common sense, with clearness of political vision, and next to his own interest he had at heart the interest of his country. Doubtless he bribed largely, but as Macaulay says: "We might as well accuse the poor Lowland farmers who paid black-mail to Rob Roy, of corrupting the virtue of the Highlanders, as accuse sir Robert Walpole of corrupting the virtue of parliament."—See Coxe, *Memoir of Life and Administration of Sir Robert Walpole*

WALPUR'GA, or **WALPURGIS,** SAINT (otherwise *Walburga*), followed her brothers St. Wilibald and St. Wunnibald (sons of a king of the West Saxons), in the time of St. Boniface, from her native country, England, to Germany, to help them in extending Christianity. Wilibald established the bishopric of Eichstadt about 741; and Wunnibald, the neighboring convent of Heidenheim about 745, the direction of which last Walpurga undertook, after his death (about 763), as the first abbess, and continued till the end of her own life (778). Her bones, from which, according to the oldest biography, a miraculous healing oil flowed, were transferred to Eichstadt, where a convent was erected in her honor. That old biography was written toward the end of the 9th c. by a monk, Wolfhart, in the monastery of Hasenried, and contained, like all the later legends, which are based solely upon it, only a multitude of marvelous stories of the usual stamp. A somewhat more special significance lies in the trait that Walpurga was not molested by biting dogs, and was in consequence invoked for protection against them and other ferocious animals. The veneration of Walpurga became wide-spread. Throughout all Germany, and even in France, the Netherlands, and England, churches and chapels were dedicated to her, relics of her were shown, and festivals celebrated in her honor. The feast of Walpurga falls properly on Feb. 25; but as in some German calendars it is assigned to May 1, the name of Walpurga has become associated, in a quite accidental way, with some of the most noted popular superstitions. May 1 had been one of the most sacred days of all paganism; it was the time of a great sacrificial festival, and of the old May assembly of the people. For centuries on May 1, informal courts of justice continued to be held, the joyful May procession took place, and the kindling of the sacred May-fire. See BELTEIN. When afterward the old heathen gods had been completely degraded into devils by the Christian missionaries, and when the belief in witchcraft had come in vogue, the Walpurgis-night obtained naturally a notorious significance, inasmuch as, during the night between April 30 and May 1, the witches were held to ride on broomsticks and he-goats to the old places of judgment and sacrifice, in order to enjoy themselves there with their master the devil. Such witch-hills were tolerably numerous in Germany and the neighboring countries. The best-known, however, was the highest point of the Harz, the Brocken, Brocks, or Brocksberg, which has obtained a wide celebrity as the scene of the witches' Sabbath in Goethe's *Faust.*

WALRUS. See MORSE.

WALSH, a co. in n.e. N. Dakota, on Red river; 1584 sq.m.; pop. '90, 16,587. Co. seat, Grafton.

WALSH, ROBERT, LL.D., 1784–1859; b. Baltimore; educated at the Jesuit college of Georgetown; studied law, but practised only a short time. He adopted literature as a profession, and in 1811 published the first American quarterly, the *American Review.* This meeting no great success was discontinued until 1827, when it was revived and edited by Walsh for 10 years. In the mean time he was editor of the *American Register,* the *National Gazette,* and the *American Magazine of Foreign Literature.* From 1845 to 1851 he was U. S. consul at Paris and correspondent of several American papers.

WALSH, The Most Rev. William J., R.C. archbishop of Dublin, Ireland; b. in Dublin in 1841; was educated at Maynooth college, Ireland. Completing his academic course in 1864, he spent three years in special ecclesiastical studies. In 1867, he became professor of theology at the college; in 1878, its vice-president, and on the death of Dr. Russell was unanimously chosen its president by the Irish bishops. He had great influence in framing the Land Act of 1881. By his exertions, a committee was appointed

to inquire into the Queen's college of Ireland. He was a senator in the Royal university of Ireland, and commissioner of national education in Ireland (1895). He was appointed to the see of Dublin (1885). He is the author of *Officium Defunctorum et Ordo Exsequiarum* (1884); *Bimetallism and Monometallism* (1893–6); *The Irish University Question* (1897).

WALSINGHAM, Sir Francis; English statesman, of an ancient Kentish family, third and youngest son of William Walsingham of Scadbury, was born at Chiselhurst, Kent, in 1536. He studied at King's college, Cambridge, and afterward traveled on the continent, where he remained until the accession of queen Elizabeth. Burleigh, with his usual discernment in selecting men of talent, discovered his abilities, brought him into office, and sent him on an embassy to France in August, 1570. He remained in Paris until April, 1573, and discharged diplomatic duties with such consummate skill that he was, on the recommendation of his great patron, appointed one of the principal secretaries of state to Elizabeth. He was also sworn of the privy council, and knighted. In 1578 he was sent on an important embassy to the Netherlands; in 1581 to France; and in 1583 to Scotland. He was, with some reason, regarded by the adherents of Mary, queen of Scots, as the most insidious of her enemies in the English council. He contrived to intercept most of her letters, and after having deciphered them, sent them to their destination, in order to obtain fresh intelligence from their answers. Some of these deciphered letters are preserved in the British museum. Walsingham soon held Mary secure in the toils. Some time previous to Sept., 1583, he had bribed to his service Cherelles, the secretary to the French ambassador Castelnau, in whom Mary placed implicit confidence. Walsingham also won over Gray, the envoy of the duke of Guise and other friends of Mary to James VI. (James I. of England), who employed him to manage his correspondence with his mother and his friends in France. The most secret letters of Mary and of James thus came into the hands of Walsingham. Up to Babington's conspiracy, or, as some have called it, Walsingham's conspiracy, there was no evidence for charging Mary with being accessory to any of the plots formed against the life of Elizabeth. The real fountain-head of this conspiracy, and the chief confederates, were spies in the pay of Walsingham, and all the correspondence of Mary and her friends passed into the hands of Elizabeth's dexterous minister. After the discovery and execution of Babington, etc., Walsingham went to Fotheringay as one of the commission to try queen Mary. She charged him with having forged the correspondence produced against her, when Walsingham rose in his place and solemnly called God to witness that he had not done anything unworthy of an honest man, and that he was wholly free from malice. Elizabeth signed her death-warrant with a jest on Walsingham's hatred of the queen of Scots. She had ordered Davison to bring her the warrant, and when she had signed it she said, "Go; tell all this to Walsingham, who is now sick; though I fear he will die for sorrow when he hears it." Walsingham was distinguished even among the ministers of Elizabeth for acuteness of penetration, extensive knowledge of public affairs, and profound acquaintance with human nature. His administration of foreign affairs was founded on the system of bribery, espionage, and deception. He is said to have had in his pay 53 agents and 18 spies, in various countries; and no minister was better informed of the intrigues of foreign courts. Notwithstanding this diplomatic duplicity, which was then universal among public men, Walsingham's personal integrity and disinterested patriotism are undoubted. He was of strict morals, favored the puritan party, and in his later days gave himself up to religious meditation. He retired from public affairs some time before his death, and resided at his house in Barn Elms, where he died April 6, 1590. Elizabeth was ready enough to acknowledge his diligence, genius, and important services, yet she kept him poor. There remain in the British museum (Harleian MSS.) various letters from Walsingham complaining of his being wholly unable, on his scanty appointments, to support his establishment, though very inadequate to his dignity of ambassador in France. Camden says he died so far in debt that he was buried privately by night in St. Paul's church, without any funeral solemnity. The queen was chary even in conferring honors upon him, for he received nothing but his knighthood, and held no offices when he resigned the charge of foreign affairs. He was married, and his daughter Frances became successively the wife of sir Philip Sidney, of the brilliant and unfortunate earl of Essex, and of the brave soldier, Richard de Burgh, 4th earl of Clanricarde.

WALTER, John, 1739–1812; b. England; was by trade a printer, and in 1780 obtained possession of two patents which Henry Johnson had received for an invention called logography, a method of printing with types containing whole words or syllables and various combinations, instead of single letters. He published, Jan. 18, 1785, the first number of the *London Daily Universal Register, printed logographically*, which, on Jan. 1, 1788, was issued as *The Times* or *Daily Universal Register*. The invention had no great success; but this paper, *The Times*, became the leading English daily journal.

WALTER, John, 1784–1847; b. London; son of John, the founder of the London *Times*. That paper, when he became its manager, in 1803, had a circulation of only 1000 copies. By 1813 it had increased to 5,000. In 1814 the *Times* began to be printed by steam. Walter was returned to parliament for Berkshire in 1832, resigned in 1837, and was elected for Nottingham in 1841.

WALTER, John, b. London, 1818; son of John. He was educated at Eton and Oxford, and called to the bar in 1847. He represented his father's borough of Notting

ham as a liberal-conservative, 1847–59; then was elected for Berkshire. He was defeated in 1865, but returned in 1868, 1874, and by a narrow majority in 1880. The *Times*, under his proprietorship, though successful, has scarcely maintained its former influence. He was a large land-holder. He died in 1894.

WALTER, Thomas Ustick, ll.d., b. Philadelphia, 1804; studied architecture. Among his designs are the Philadelphia co. prison, Girard college, the U. S. capitol extension, and the new treasury building. He long held the chair of architecture in the Philadelphia Franklin institute. He died in 1887.

WALTHAM, a city in Middlesex co., Mass.; on the Charles river and the Fitchburg and the Boston and Maine railroads; 10 miles w. of Boston. It was incorporated as a town in 1738, and as a city in 1884, and contains a public library, hospital, home for the feeble-minded, Leland home for aged women, high and graded public schools, Prospect Hill park, electric light and street railroad plants, water-works owned by the city, national and savings banks, and daily and weekly newspapers. The city is particularly noted for its extensive watch-making industries, also for its cotton mills, bleachery, and manufactories of electric clocks, hosiery, and crayons. Pop. '90, 18,707.

WALTHAM ABBEY, a market t. in the county of Essex, on the banks of the Lea, 12 m. n. of the e. part of London, on the Great Eastern railway. It contains a spacious Norman church, originally belonging to an abbey. The river Lea here divides into several branches, which are made to turn a number of gunpowder and flour mills belonging to government. Enfield Lock, at which is situated the celebrated government factory for rifles, etc. (see Small-arms, Factories, Royal), is about a mile distant; and many of the hands there employed live in and around Waltham Abbey. Pop. '81, 5368; '91, 6066.

WALTHER VON DER VOGELWEIDE, the greatest and most famous minnesinger (q.v.) of the Middle Ages, was b. 1165–70 in Franconia or in Austria. Although his family was noble, he had no possessions, and became a minstrel as much, perhaps, from necessity as from impulse. His master and early model was the elder Reinmar. It is thought that his first public performances in "singing and saying" date from about 1187; soon after which, he found a warm patron in Friedrich the Catholic, duke of Austria. But this prince having died in 1198, Walther began the life of a wandering minstrel, in the course of which he visited the courts of most of the German sovereigns. A few details of his career are known. He twice (1199 and 1205) spent some time at the court of the emperor Philip; and then lived six years at Eisenach with a generous patron, Hermann landgraf of Thuringia. During 1214–15 he repeatedly visited the emperor Otho, by whom, as well as by Philipp, he seems to have been treated with unkingly parsimony. From 1217 to 1219 he lived with duke Bernhard in Carinthia, then returned to Austria, and in 1220 received from Friedrich II. a small estate at Würzburg. He died about the beginning of 1228. His grave has long been pointed out in the Laurence garden of the cathedral of Würzburg; but a new monument was erected to him in 1843. Walther far excelled his master Reinmar, whom he survived about 20 years, both in matter and style; while in richness and versatility of mind all the other minnesingers must stand far behind him; for, to his wide sympathies and matured art, all themes were alike: tenderness and depth, no less than cheerfulness and gayety, deep earnestness, as well as playful raillery. He did not confine himself, like Reinmar, to minnelays, but wrote also hymns, eulogies of his patrons, and didactic pieces. He sang of the duties and dignities of the emperor; of the obligations of princes and vassals; of the rights and wrongs of the question between the pope and the emperor; of the glory of the true church; and often his song conveyed earnest and cutting censure. But it was only on conviction that he gave praise or blame, never influenced by favor or prejudice; and his censures of the church were those of a candid but pious believer. From a decided patriotic feeling, he stood firmly by the empire and the emperor in opposing the pretensions and usurpations of the pope. His writings on this subject had a widespread and powerful effect; they alienated, according to the testimony of a contemporary, Thomasin, thousands from the pope, and determined the politics, so to speak, of the German poets for the whole century. Walther was soon recognized by his contemporaries as the master of lyric poetry; and the traditions of the later minnesinger schools place him among the twelve who, in the emperor Otho the great's time, originated and established the noble art of minstrelsy. Lachmann brought out a masterly critical edition of Walther's writings (Berl. 1827, 3d ed. 1853); and Simrock an excellent translation (with explanations by Simrock and Wackernagel, 2 vols. Berl. 1833; 2d ed. Leip. 1853); Uhland wrote a beautiful account of his life and writings (*Walther von der Vogelweide, ein altdeutscher Dichter*, Stuttg. and Tüb. 1822); and Hornig, a complete *Glossarium* to his poems (Quedlinb. 1844).—See Reuss, *Walther von der Vogelweide* (1843); Daffis (1854), Opel (1860), Rieger (1863), Kurz (1863), and Menzel (1865).

WALTON, a co. in n.w. Florida, having the gulf of Mexico and Choctawhatchee bay on the s.; about 1360 sq.m.; pop. '90, 4816, chiefly of American birth, with colored. Co. seat, De Funiak Springs.

WALTON, a co. in n. Georgia; 389 sq.m.; pop. '90, 17,467, chiefly of American birth, inclu. colored. Co. seat, Monroe.

WALTON, Brian, d.d., 1600–61; b. England; graduated at Cambridge, 1619; rector of St. Martin's Orgar, London, 1626; and of Sandon in Essex, 1636. Being involved in

the troubles of the times he was deprived of his rectories; but undismayed, he planned the famous polyglot Bible for which £9,000 was subscribed. He had various learned helpers, but the editorship devolved on himself. The great work was finished in 4 years. It employs in all 9 languages. The four gospels are in six, and the rest of the New Testament in five. At the restoration he regained his preferments, and was consecrated bishop of Chester in 1660.

WALTON, George, 1740–1804; b. Va.; studied law, and was admitted to the Georgia bar, 1774. He took an active part in the events which led to the revolution; 1775–81, a delegate to congress; at the defense of Savannah was wounded and made prisoner. He was twice governor of Georgia; chief-justice of the state, 1783; judge of the U. S. supreme court, 1793; and U. S. senator, 1795–96. He was one of the signers of the declaration of independence.

WALTON, Izaak, author of the *Complete Angler*, was the son of one Jervis Walton, a yeoman, and was born at Stafford on Aug. 9, 1593. Of his earlier life not much is certainly known. In the year 1624 we find him settled in Fleet street, London, and carrying on business there as a hosier. In the end of 1626 he married Rachel Floud, a descendant of Archbishop Cranmer. From George Cranmer, her uncle, who had been a pupil and friend of Hooker, it is thought likely that Walton derived much of the material for his life of that eminent man. In Aug., 1640, she died in giving birth to a daughter, having before had two sons, neither of whom survived her. In 1643 Walton retired from business with such a modest competence as sufficed for the simple way of life he affected; and in 1647 he married a second time. The lady was Anne Kenn, half-sister of the well-known bishop of that name. She bore to him a daughter and two sons, only one of whom lived, and died in 1662, to the great grief of her husband, who survived her many years. He died on Dec. 15, 1683, at the great age of 90, in the house of Dr. Hawkins, his son-in-law, prebendary of Winchester cathedral, and was buried in the vault of that sanctuary.

With the celebrated Dr. John Donne, who died in 1631, Walton, who attended his ministry, had been on terms of affectionate intimacy; and on the publication of his sermons in 1640 he was induced to preface them with a life of the author. This, his first publication, was followed by lives of Hooker, Sir Henry Wotton, and George Herbert, in succession; the whole four being reissued in a collected edition in 1670. In 1678 the life of his friend, Bishop Sanderson, was added. *The Complete Angler, or Contemplative Man's Recreation*, was published in 1653. A fac-simile of the original edition was published in 1876, and since the first, nearly a hundred editions have appeared. To the edition of 1676 a little treatise on fly-fishing was added by Walton's friend, Charles Cotton, in a fishing-house built by whom, on the banks of the river Dove, many of the later days of his happy and blameless life lapsed peacefully in the pursuit of his favorite recreation. *The Complete Angler*, as a treatise on the art of angling, may be regarded as in good part obsolete, but it continues and will continue to be read for its charming simplicity of manner, its pastoral freshness and poetry, and the pure, peaceful, and pious spirit which is breathed from its quaint old pages. The *Lives*, though somewhat less widely known, are in their kind not less exquisite and unique. Wordsworth has dedicated to them a beautiful sonnet. Up to 1883 there had been issued ninety-seven editions of *The Complete Angler*. Among the best are those of Hawkins (1760), Nicolas (1836), Bethune (N. Y. 1847), Dowling (1857), and the fac-simile of the original edition. See the Life of Walton by Dowling (1884), and an article in *Scribner's Magazine* for September, 1893.

WALTZ (Ger. *Wälzer*, literally, roller), a national German dance, said to have originally come from Bohemia. It first became a fashionable dance in the other countries in the early part of the 19th century. It is danced to music of $\frac{3}{4}$ time by any number of couples, who, with the gentleman's right arm round his partner's waist, wheel rapidly round on an axis of their own, advancing at the same time round the room. Some time ago the *valse à deux temps* was generally adopted—a form of the waltz not so graceful as the older one, because not so correspondent to the rhythm of the music—but this has now given place to the *valse à trois temps*.

WALWORTH, a co. in n. S. Dakota, having the Missouri river for its w. boundary; about 740 sq.m.; pop. 1890, 2153, chiefly of American birth. Co. seat, Bangor.

WALWORTH, a co. in s. Wisconsin, containing Geneva lake, 9 m. long; 570 sq.m.; pop. '90, 27,860, chiefly of American birth, with colored. Co. seat, Elkhorn.

WALWORTH, Reuben Hyde, ll.d., 1789–1867; b. Conn.; lived on a farm, taught school, and in 1809 was admitted to the bar. He began to practice at Plattsburg, and soon rose to a high rank in his profession. During the war of 1812 he was adjt.gen. of the state militia, and took part in the operations about Plattsburg. He was a master of chancery, and served in congress, 1821–23. He became a justice of the circuit court in 1823, and was chancellor of the state, 1828–48. His decisions are reported in Hill, Wendell, Denio, Barbour, and Page. His rank as an equity judge was high. He published *Rules and Orders of the New York Court of Chancery* (1829); and *Hyde Genealogy* (1864).

WAMPUM, a name given to shells and shell-beads, used as money, and worn for ornaments in strings and belts by the North American Indians.

WANAMAKER. John, b. Philadelphia co., Penn., 1838; received a common school education; entered mercantile life in Philadelphia, and built up the largest retail business in the U. S. He originated the Wanamaker system of retail business, one notable feature of which is the return of money for goods purchased upon the return of the goods by a dissatisfied purchaser. He was a member of the Centennial exhibition board, and chairman of the Bureau of Revenue. He is very active in Christian and philanthropic work, and is pres. of the Young Men's Christian assoc. in Philadelphia. He declined the nomination for congressman-at-large, 1883. In 1889 he became postmaster-general in Pres. Harrison's cabinet. In 1896 he opened in N. Y. city the store built by A. T. Stewart.

WANDERING JEW, The. The legend of the wandering Jew, who cannot die, but, as the punishment of his sin, is obliged to wander over the face of the earth till Christ shall pronounce his doom at the last day, seems to have originated in that passage of the gospel of St. John (xxi. 22) where Jesus says of John: "If I will that he tarry till I come, what is that to thee? follow thou me. Then went this saying abroad among the brethren, that that disciple should not die." It arose, probably, in the 13th c., when it is first related by Matthew Paris, and may be supposed to indicate the Jewish people, scattered throughout the world, and nowhere finding a home. According to the current legend, the wandering Jew is Ahasuerus, the shoemaker at Jerusalem, who, when the Saviour wished to rest before his house, on his way to Golgotha, drove him away. Another legend states him to be Pilate's door-keeper, Kartaphilus, who struck Jesus on the back as he led him out of his master's judgment-hall. So recently as the last century impostors took advantage of the belief in this legend, and gave themselves out for the wandering Jew; and people were not wanting who, from time to time, maintained that he had appeared to them under different forms. A popular book relating in detail the history of the wandering Jew has been repeatedly printed in the German, French, Dutch, and Latin languages. The legend has likewise been frequently worked up in a poetical form, as by A. W. von Schlegel in the romance entitled *Die Warnung;* by Schubert in his poem of *Ahasuer;* by Goethe in *Aus meinem Leben;* by Mrs. Norton in *The Undying One* (Lond. 1842); and by Eugène Sue in his *Le Juif errant.* Compare Grässe, *Die Sage vom Ewigen Juden.*

WANDEROO', a name which has been given to several species of monkey. The species commonly described under the name is *macacus silenus* or *silenus veter*, a native of the coast of Malabar, a monkey of rather large size, deep black throughout, except a ruff of long gray or white hair, from the midst of which the face looks forth, and which descends over the chest, giving the animal a very peculiar aspect. This monkey exhibits considerable intelligence and docility, and performs its tricks with an absurd air of gravity.—The name wanderoo, however, more properly belongs to monkeys of the genus *presbytes*, natives of Ceylon, to which it is given by the Singhalese, and appears to have been transferred by mistake to the species just described, which is not found in Ceylon. The wanderoos of Ceylon are all small monkeys. The best-known species is *presbytes cephalopterus*, found in the low parts of the island. It feeds chiefly on the berries and buds of trees, and is seldom seen on the ground. Twenty or thirty are generally found together in a troop. When alarmed, they display marvelous agility in leaping, or rather swinging from branch to branch, using their powerful arms alternately, often flinging themselves obliquely so as to catch the lower bough of an opposite tree, and taking advantage of its rebound to carry them up again till they can reach a higher branch; the females, all the while, being often encumbered by their young, which cling to them. This monkey is far from being so mischievous as monkeys in general. "In captivity it is remarkable for the gravity of its demeanor, and for an air of melancholy in its expression and movements which is completely in character with its snowy beard and venerable aspect."—Tennent's *Ceylon.* Its disposition is extremely gentle and affectionate; it is intelligent and docile, and very cleanly in its habits.—Several other species of wanderoo or *presbytes* are found in Ceylon, some of them in the more elevated parts of the island.

WANTAGE, a market-t. in Berkshire, in the vale of the White Horse, 13 m. s. w. of London, and 60 w. of London. It manufactures agricultural implements, and has an extensive trade in corn. It was the birthplace of Alfred the Great and of Bishop Butler. Pop. '81, 3488; '91, 3669.

WAPELLO, a co. in s.e. Iowa, drained by the Des Moines river; 432 sq.m.; pop. '90. 30,426. Co. seat, Ottumwa.

WAP'ENSHAW (Sax. *wæpen*, weapon, and *sceawan*, to show), a periodical gathering of the people, instituted by various Scots statutes, for the purpose of exhibiting their arms, these statutes directing each individual to be armed on a scale proportioned to his property. There are numerous Scots acts of the 15th and 16th centuries, regulating the subject of wapenshaws. In the time of war or rebellion, proclamations were issued charging all sheriffs and magistrates of burghs to direct the attendants of the respective wapenshawings to join the king's host. During the reign of the later Stuarts, atten-

dance on the wapenshaws was enforced with considerable strictness; and in addition to military exercises, sports and pastimes were carried on by authority at these gatherings.

WAP'ENTAKE (Sax. *wæpen*, arms, and *tac*, touch), a name given in Yorkshire to the territorial divisions of the county, similar to what, in most of the other counties of England, are called *hundreds*, and, in the more northern counties, *wards*. The term has come down from Anglo-Saxon times, where it, in the first instance, signified the assemblies of each district held for the administration of justice and like purposes, at which each vassal attended armed, and "touched" the spear of his overlord, in homage.

WAPITI, *Cervus Canadensis*, a species of deer, nearly allied to the stag, but considerably exceeding it in size, being 4½ feet in height at the shoulder. It is a native of North America, found as far s. as Carolina, and as far n. as 56° or 57° n. lat. It is yellowish brown on the upper parts; the sides gray; a pale yellowish patch on each buttock, bounded by a black line on the thigh; the neck, a mixture of red and black, with long, coarse, black hair, falling down from it in front like a dewlap; a black mark at each angle of the mouth. The hair is crisp and hard, but there is a soft down beneath it. The antlers are large, much like those of the stag, but the first branch bends down almost over the face. The wapiti is called *elk* and *gray moose* in some parts of America, although very different from the true elk, or moose deer.

WAPPERS, Gustave; 1803–74; b. Antwerp; studied art in Flanders and at Paris, and became a historical painter of the romantic style. By Leopold I. he was made a baron and director of the Antwerp academy. In 1855 he removed to Paris, where the rest of his life was spent. His best works are, "Christ at the Sepulcher," "Charles IX. on the night of St. Bartholomew," "Execution of Anne Boleyn," and "The Great Fishery of Antwerp."

WAPPINGER, a town in Dutchess co., N. Y.; on Wappinger's creek and the Poughkeepsie and Wappinger's Falls electric railroad; 8 miles s. of Poughkeepsie. The village of Wappinger's Falls is partly in each of the towns of Poughkeepsie and Wappinger, and has Union school No. 1, a graded school, the Grinnell public library, public park, savings bank, print works, various manufactories, and a weekly newspaper. The creek here falls 94 feet to tidewater, and besides beautiful scenery provides excellent power for manufacturing. Pop. '90, town, 4575; village, 3718.

WAR between states or nations, or between parties in the same state (*civil war*), is analagous to club-law (Ger. *faustrecht*), or the law of the strongest, among the individuals of a community, which is the normal state of things where no legal or fixed rights are established, or where there is no authority to enforce them. The prevalence of war among nations is thus an indication of the imperfection, or the total want, of international law. If the sentiment of brotherhood were universally diffused, and a system of international morality established and generally accepted, together with an organization for putting it in force, we can conceive the necessity for war to cease. And although the full realization of this state of things may never be attained, it is nevertheless the ideal goal to which all real progress tends. But it by no means follows that in the present condition of the world, while the sentiment of international justice is yet in embryo, peace at any price is to be preferred to war. When a community is in a state of anarchy, the individual man must take the law into his own hands, and defend his life and his rights with violence if need be; and nations in similar circumstances must do the same. The balance of power (q.v.), the shape in which the sentiment of political morality in Europe seemed at one time trying to crystallize itself, has gone again apparently into chaos.

Wars are various in their occasions and objects, sometimes breaking out in consequence of disputes about territorial possessions or material interests; at other times, having reference to the establishment of some important point of civil or religious liberty. In all cases, the aim of each contending party is to weaken and overthrow the opposing party. At one time the art of war was supposed to consist very much in wearing out the enemy by a slow process of exhaustion, and thus wars were much protracted; but more recently the greatest generals have adopted the method of rather endeavoring to strike sudden and terrible blows, by which the war is sooner brought to a termination; and this method, although it may often have been adopted without regard to considerations of humanity, is, in all probability, less productive of suffering to mankind than the other.

Among rude nations, wars are conducted by tumultuary hosts, suddenly congregated, and in general, either after defeat or victory, soon dispersed. But the wars of the more civilized and powerful nations have long been conducted by armies carefully trained and disciplined; and in the case of maritime powers, by means of fleets at sea as well as of armies on land. Preparation for war among such nations requires not only the forming and training of the army, but vast provision in many various ways of the means and *matériel* of war. Much science and skill are also applied to the conduct of military operations, and the principles upon which they ought to be conducted have been carefully investigated, and theories tested by an examination of the history of the most important campaigns. See Strategy, Tactics.

In the progress of society, certain *usages of war* have come to be generally recognized. These, of course, have varied at different times, and in different parts of the world, according to the state of civilization and the prevalent feelings of the time; they are also subject to modification from causes less general. But the changes which have taken

place in them during the lapse of ages have been in general favorable to the interests of humanity. Prisoners of war are no longer put to death, nor are they reduced to slavery, as was once very frequently the case, but their treatment has become generally more and more mild and kind. It is a well-understood rule, however, that a prisoner of war obtaining his liberty by exchange or otherwise, with the condition of not serving again during a fixed period against the same power, forfeits his life if he is found so serving and is again taken prisoner. Amongst all civilized nations, quarter is granted in battle whenever it is sought; and there are certain usages universally prevalent with regard to the capitulation of fortified places, and of bodies of troops hopelessly hemmed in by superior forces, etc.

War-cries for mutual recognition and encouragement in battle have always been common, each rude nation or tribe having its own. The ancient war-cry of the English was *Saint George!* that of the Spaniards, *San Jago!* and that of the French, *Mountjoie Saint Denis!* In the feuds of the middle ages, each party, or the retainers of each noble family, had a distinctive war-cry. Sometimes the war-cry was the name of the family. Thus, in Scotland, the retainers of the noble houses of Douglas and of Home rushed into battle with the cry of *A Douglas! a Douglas!* or *A Home! a Home!* The French armies under Napoleon were accustomed to charge with shouts of *Vive l'Empereur!*

The invention of gunpowder has effected great changes in the whole art of war; but the introduction of fire-arms has rendered battles less sanguinary and ferocious than they previously were. While fire-arms were yet unknown, warlike engines of various kinds were employed; but close combat was more general, and often more protracted, and the passions of the combatants had thus in ordinary battle more of that exasperation which fearfully characterizes the storming of a town. See INTERNATIONAL LAW.

In the United States, the war department is an executive department of the government, having charge of all the military affairs of the country, and was established by act of Aug. 7, 1789. The secretary of war is its head, and the first to fill the office was Henry Knox. The secretary of war has custody of all records, etc., relating to the army, superintends purchases of military supplies, directs army transportation, distributes stores, etc., has charge of the signal service and meteorological records, disburses appropriations for rivers and harbors and for their survey and improvement, and superintends and supplies arms and munitions of war. An annual report of all contracts, appropriations, disbursements, etc., is submitted to congress by the secretary of war. The correspondence and accounts are in charge of the chief-clerk of the war department. Ten military bureaus compose the department, each having at its head an officer of the regular army, who receives a salary of $5000 while thus employed. The bureaus are those of the adjutant general, the inspector general, the quarter-master general, the commissary general, the surgeon general, the paymaster general, the chief of engineers, the chief of ordnance, the chief signal officer, and the judge advocate general. More than 1400 clerks and other assistants are employed. The expenses of the department in 1890, including appropriations for rivers and harbors, were $44,582,838.08.

WARASDIN', capital of a co. in the Austrian kingdom of Croatia, upon the right bank of the Drave, and 28 m. n.n.e. of Agram. It is to some extent fortified, is surrounded by straggling suburbs, and contains several Catholic churches, two convents, and a gymnasium. Silk-spinning is carried on; and stoneware, wine, and tobacco are manufactured. Pop. '90, 11,055.

WARBECK, PERKIN. See HENRY VII.

WARBLER, a popular name often applied to all the birds of the family *sylviadæ* (q.v.), many of which, however, commonly receive other popular names, as the black cap, nightingale, hedge-sparrow, redbreast, redstart, stone-chat, wheat-ear, white-throat, etc. (q.v.), while many receive the name warbler with some adjunct. Several British species, commonly thus designated, belong to the genus *salicaria*, others to the genus *sylvia*. The species of the former genus have the tail rounded; in the latter, it is almost square or a little forked. The *salicariæ* are also inhabitants of moist situations, whence they are known as *sedge warblers* and *reed warblers;* the *sylviæ* are inhabitants of woods. Of the former genus is the GRASSHOPPER WARBLER (*salicaria locustella*), not unfrequent in many parts of England, and found also in the s. of Scotland and in Ireland. It is found in most parts of the center and s. of Europe, at least during summer, being partially a bird of passage. It is of a greenish-brown color, the centers of the feathers dark brown, producing a spotted appearance; the lower parts pale brown. It is a shy bird, hiding itself in hedges and bushes, but very active, often darting out like a mouse from the bottom of the hedge, and receives its name from its chirping, grasshopper-like note.—The SEDGE WARBLER (*salicaria phragmitis*) is the most common British species of *salicaria*, and is generally found in thick patches of reeds or willows in marshes, or in other situations close to water, and where the aquatic herbage is thick and strong. It abounds on the marshy banks of the Thames. It is of a brown color, exhibiting various shades, finely intermixed; the chin and throat white; the under parts buff color.—The REED WARBLER (*salicaria arundinacea*) is found in summer in marshy situations in the s. of England; it abounds in Holland and in many parts of Europe, and its range extends to the n. of India. It is of a uniform pale brown, with a tinge of chestnut; the chin and throat white; the under parts pale buff color. Its nest is

remarkable; it is attached to the stems of three or four reeds, and formed by winding the branches of their panicles together with a little wool; and is conical and deep, so that the eggs or young may not be shaken out when the reeds are shaken by the wind. —The WOOD WARBLER, also known as WOOD WREN (*sylvia sylvicola*), is common in the wooded districts of England in summer, particularly in old plantations of oak and beech. It is olive green, tinged with yellow, the wings brown, the primaries and secondaries edged with bright yellow, the tertials with a broader edge of yellowish white; the lower parts yellow and white.—The WILLOW WARBLER (*sylvia trochilus*), is very common in the s. of England in summer, but more rare in northern parts of Britain. It frequents woods, shrubberies, thick hedgerows, and bushes; but builds its nest on the ground. It is of a dull olive-green color, the wing and tail feathers dark brown, the wing-feathers edged with green; the under parts whitish, slightly tinged with yellow. The tail is slightly notched. There are other British species of more rare occurrence.—Numerous species of warblers are found in North America, migratory birds, which spend the winter in more southern regions. Not a few of the same species are therefore reckoned among the birds of the West Indies. Some of the European species are in like manner found in Africa; and Asia has many species of warblers, among which some of the European species are included. Australia has many species of warblers, some of which are of very beautiful plumage.

WARBURTON, ELIOT BARTHOLOMEW GEORGE, 1810–52; b. Ireland; educated at Cambridge; admitted to the bar, but devoted himself to the care of his estates in Ireland, to travel and literary pursuits; traveled in the east, 1843, and published on his return, *The Crescent and the Cross, or Romance and Realities of Eastern Travel.* He settled in London, and published: *Reginald Hasting*, a romance; *Memoir of Horace Walpole and his Contemporaries; Hochelaga; Darien, or the Merchant Prince*, a historical romance. While on a voyage to the West Indies in 1852 he perished in the burning of the steamer *Amazon* off Land's End.

WARBURTON, WILLIAM, a distinguished English divine, commonly known as bishop Warburton, was born at Newark, in the county of Nottingham, on Dec. 24, 1698. He was the eldest son of George Warburton, an attorney of that place, who claimed descent from an old Cheshire family. Young Warburton received his education at the school of his native town, and afterward at Oakham in Rutlandshire, which he left in the year 1714, returning home to pursue the profession of his father, who had died some years before. Having served the necessary apprenticeship, he practiced as an attorney at Newark for some years, but with no distinguished success. His natural bent was toward literature; and he had all along expressed a desire to take orders in the church of England. Finally, he quitted the legal profession with this object in view; and having gone through the necessary course of study, he was presented by sir Robert Sutton, in 1728, to the rectory of Brand-Broughton, in the diocese of Lincoln, where he remained for many years. After publishing some comparatively unimportant pieces, he issued, in 1736, a treatise, entitled *The Alliance between Church and State, or the Necessity and Equity of an Established Religion and a Test Law.* This work, which is still recognized as one of the most masterly statements of the subject from the point of view of the writer, drew great and immediate attention; and in January, 1737–38, it was followed by the first volume of the *opus magnum*, on which his fame as a theologian must mainly continue to rest. This celebrated work, *The Divine Legation of Moses, demonstrated on the Principles of a Religious Deist, from the Omission of the Doctrine of a Future State of Rewards and Punishments in the Jewish Dispensation*, though it encountered a storm of adverse criticism, to which the writer thought it necessary to reply in *A Vindication*, etc., at once established the position of Warburton as one of the most potent intellects of the period; and though its main argument has since been extensively discredited as more or less "precarious," not the less the book, in virtue of its vast learning, its vigor, and originality, will always maintain its reputation as one of the masterpieces of the great period of our English theology. In 1739, a new and revised edition of the first part of the work appeared. This was followed, in 1741, by the publication of the second part; and the third and concluding section, rather supplementary to the argument than essential to it, was only given to the world after the death of the writer.

Becoming involved in the controversy which followed the appearance of Pope's *Essay on Man*, Warburton undertook the defense of the poet, and, in 1739–40, issued a series of seven letters, entitled *A Vindication of Mr. Pope's Essay on Man, by the Author of the Divine Legation.* The poet was much gratified; and between him and his vindicator a warm friendship was the result, which only terminated with the death of Pope, in 1744. He died, bequeathing to Warburton one-half of his library, and such profit as might accrue from any edition of his works published after his death. To Pope, Warburton was indebted for opportunities of cultivating the friendship of some of the most distinguished men of the time—among others, of the well-known Ralph Allen, of Prior park, near Bath, to whose niece, Miss Gertrude Tucker, he was married in 1745.

Though Warburton's important services to literature and religion were admitted, they did not for a long time bring him any very great recognition in the way of substantial preferment. On the appearance of *The Divine Legation*, indeed, he had been appointed

chaplain to the prince of Wales; and in 1746, nearly ten years later, the society of Lincoln's inn unanimously elected him to be their preacher. In 1757, he was promoted to the deanery of Bristol; and finally, in 1760, Mr. Pitt, afterward earl of Chatham, bestowed on him the bishopric of Gloucester, declaring that "nothing of a private nature, since he had been in office, had given him so much pleasure" as this exercise of his patronage. In the later years of his life his mind became seriously impaired; and he was utterly prostrated by the loss of his only son, whom he did not long survive. He died on June 7, 1779.

Warburton was a keen polemic, and deeply engaged in all the intellectual warfare of his time. In nearly everything he wrote, there is the impress of a vigorous and fertile mind, with an arrogance of tone, which tends, in his treatment of adversaries, to degenerate into truculence and scurrility. In addition to those already mentioned, it seems sufficient to give the titles of a few of his more notable performances. In 1750 appeared his *Julian, or a Discourse concerning the Earthquake and Fiery Eruption which defeated that Emperor's Attempt to rebuild the Temple at Jerusalem, apropos* of Dr. Middleton's *Inquiry concerning the Miraculous Powers of the Christian Church.* Shortly after came two volumes entitled *The Principles of Natural and Revealed Religion occasionally Opened and Explained;* and in 1755, *A View of Bolingbroke's Philosophy, in a Series of Letters to a Friend,* which was held to be much the ablest of all the answers to Bolingbroke which appeared. In 1757, he attacked Hume, in a publication entitled *Remarks on Mr. David Hume's Natural History of Religion by a Gentleman of Cambridge, in a Letter to the Rev. Dr. Warburton.* The blind deceived no one; and if we may estimate the success of the attack by the annoyance it gave the philosopher, his allusion to "that low fellow Warburton" may be held to indicate success. In 1747, he went somewhat out of his way to issue an edition of Shakespeare, with notes critical and emendatory, which last, though ingenious, and occasionally happy, did not greatly add to his reputation. A complete and splendid edition of his works was published in 1788, at the expense of his widow, by his friend, bishop Hurd, who prefaced it with a biography.

WARD, in law, in the feudal system, the minor heir of a tenant *in capite* of the king. The expression was extended to all minors under guardianship. A ward under guardianship can bind himself by contract only for necessaries. The guardian stands *in loco parentis* to his ward. The ward is entitled to an account by the guardian of the latter's administration of the estate. See GUARDIAN.

WARD, a co. in N. Dakota, incorporated 1885; 1512 sq.m.; pop. '90, 1681. Co. seat, Minot.

WARD, a co. in w. Texas; 1160 sq. m.; pop. '90, 77. Co. seat, Barstow.

WARD, ARTEMAS, 1727–1800; b. Mass.; American gen. He was graduated at Harvard in 1748, was a member of the colonial legislature and council, and was justice of the court of common pleas in Worcester co. He served in the French and Indian war as lieut.-col. under Abercrombie, and when the revolutionary war broke out, was appointed first maj.-gen. by congress, and as such commanded the army at the siege of Boston, until Washington was elected commander-in-chief, when he was made second in command. He resigned in Apr., 1776. He was 16 years in the Mass. legislature, and in congress from 1791–95.

WARD, ARTEMUS. See BROWNE, CHARLES FARRAR.

WARD, EDWARD MATTHEW, R.A., an eminent painter of the present century, was b. in the year 1816, in London. He early displayed a taste for art, and was educated in a way to develop it. In 1834 he was sent to study at the Royal academy; and two years after, he went to Rome, where he remained for some time, gaining, in 1838, a silver medal, given by the academy of St. Luke. He returned to England in 1839, making on the way a short visit to Munich, where he studied under Cornelius. He was a royal academician in 1856 and died, 1879.

WARD, ELIZABETH STUART PHELPS. See PHELPS, ELIZABETH STUART.

WARD, GENEVIEVE (Countess Guerbel), b. New York, in 1833. She studied music in New York and Italy; married Count Constantine Guerbel, a Russian officer, and made her first appearance in public under the name of Guerrabella at Milan, 1859. She sang with great success in various operas in Italy, France, and England; and came to America, 1862. Shortly afterwards she lost her voice through illness. Compelled to earn her living, she for a while gave music lessons, and then studied for the stage, making her début with success as "Lady Macbeth" at the Theatre Royal, Manchester, England, 1873. Her most famous part was that of "Stephanie" in *Forget-Me-Not.* She went to England in 1888 and later joined Irving's company.

WARD, HENRY AUGUSTUS, b. N. Y., 1834; educated at Williams college and at the Lawrence scientific school, Cambridge, where he was for some time Prof. Agassiz's assistant in zoölogy. He subsequently studied in Paris and Freiberg; traveled extensively in the east and in Africa, exploring the river Niger. As a mining engineer he was employed in the far western states, and visited South America and the West Indies; he was also naturalist to the Santo Domingo expedition of 1871. From 1861 to 1866 he was professor of natural sciences at Rochester university, where he established extensive collections of fossils and geological specimens.

WARD, JAMES, 1769–1859; b. London; began life as an engraver; became a painter of the school to which Morland belonged, whom he is said to have copied; member of the academy, 1811. "The Alderney Bull, Cow, and Calf," in the National Gallery, is considered a masterpiece. He excelled as a painter of rural subjects.

WARD, JOHN QUINCY ADAMS, b. Ohio, 1830; studied medicine, but in 1850 entered the studio of H. K. Brown, the sculptor, and after studying art there for six years, went to Washington, and in 1861 opened a studio in New York. Among his works are the bronze statues in Central park, "Shakespeare," "Private of the Seventh Regiment," "Fitz-Greene Halleck," "The Pilgrim," the "Indian Hunter," "Poetry," etc.; statues of Horace Greeley, H. W. Beecher, etc.; bust of A. W. Holley. In 1872 he was made president of the National Academy of Design. In 1893 he was one of the founders of the National sculpture society and became its first president.

WARD, MARY AUGUSTA ARNOLD (Mrs. HUMPHRY W.), b. Hobart, Tasmania, 1851; the eldest daughter of Thomas Arnold, M.A., of University coll., Oxford, and granddaughter of Thomas Arnold, D.D., of Rugby. She was married in 1872 to Thomas Humphry Ward, fellow of Brasenose coll., Oxford, author, and editor of a standard edition of *The English Poets*. She now resides in London. Her first work, *Milly and Olly*, a book for children, appeared in 1881. In 1884 she pub. *Miss Bretherton*, a novel; in 1885 a translation, with introduction, of Amiel's *Journal Intime*, and in 1888, the powerful novel, *Robert Elsmere*. She has contributed to the leading English quarterlies on the literature, politics, and art of European countries; to *The English Poets*, above mentioned, etc. In 1892 appeared *David Grieve*, in 1894 *Marcella*, and in 1895 *The Story of Bessie Costrell*.

WARD, NATHANIEL, 1578–1652; b. England; graduated, Cambridge, 1603; bred a lawyer; traveled on the continent; studied theology; rector of Standon Massye, Essex, 1626; suspended by Laud for non-conformity, 1633; came to America, 1634; colleague pastor of Thomas Parker, and afterward of John Norton, at Ipswich, 1634–37; published *Body of Liberties*, the first code of laws enacted in New England, adopted, 1641; took part in the settlement of Haverhill, Mass., 1640; returned to England, 1646; pastor of Shenfield, 1648. He published *The Simple Cobbler of Agawam*, a politico-religious satire; *Mercurius Anti-mechanicus, or the Simple Cobbler's Boy with his Lap-full of Caveats*. He was a famous wit, and something of a poet.

WARD, SAMUEL, 1725–76; b. R. I.; son of Richard, governor of Rhode Island. He served in the assembly of the colony, 1756–59; was chief-justice, 1761; governor, 1762 and 1765–67. He was a member of the committee of correspondence, and of the congress at Philadelphia in 1774–75. He was one of the founders of Brown university.

WARD, SAMUEL, 1756–1832; b. R. I.; educated at Rhode Island college. He accompanied Arnold's expedition against Quebec in 1775; was captured, and remained a prisoner till 1776. He afterward served in New Jersey and elsewhere. Settling in New York, he became a merchant and acquired a considerable fortune. He was a member of the Hartford convention.

WARD, WILLIAM, 1769–1823; b. England; was a printer, studied theology; became a Baptist preacher; was sent by the Baptist missionary society as a missionary and printer to India, 1799; forbidden by the East India company to remain at Calcutta, he settled at Serampore; printed the Bengalee New Testament and other translations of Dr. Carey; visited England, Holland, and the United States, 1819; returned to Serampore, 1821. He published, besides other books, *An Account of the Writings, Religion, and Manners of the Hindus, including Translations from their Principal Works*.

WARD, WILLIAM HAYES, D.D., LL.D., b. Mass., 1835; graduated at Amherst coll., 1856, and Andover theological seminary, 1859; ordained a Congregational minister, 1859; supplied two churches in Kansas; teacher of natural science, Beloit college, 1857–58; and in Utica free academy, 1862; professor of Latin, Ripon college, Wis., 1865; became a member of the editorial staff of the New York *Independent*, 1868; superintending editor, 1870, which position he still occupies. Dr. Ward has given special attention to oriental studies, has read valuable papers before the American oriental society, and contributed articles in the *Bibliotheca Sacra* on Assyriology: in these departments he has made extensive research, and holds high rank among scholars.

WARDEN, an officer appointed for the naval or military protection of some particular district of country. In order to keep the districts of England adjoining to Scotland and Wales in an attitude of defense, great officers, called lords wardens of the marches, were appointed, to whom the duty of protecting the frontier was committed. From this source originated the name *ward*, applied to the subdivisions of the counties of Cumberland, Westmoreland, and Durham—a term afterward extended to divisions of a city, town, or burgh adopted for municipal purposes. The custodier of Dover castle was created by William the Conqueror warden of the Cinque ports (q.v.), and guardian of the adjacent coast; an office comprising extensive jurisdiction, civil, naval, and military, the greater part of which was taken away by 18 and 19 Vict. c. 48.

WARDEN. See CHURCH WARDEN.

WARDHOLDING, the military tenure of land in Scotland under the feudal system, by which the vassal was bound to serve the superior in war whenever called on to do so. As the military duties of the vassal could not be performed when he was under age, the

superior had a right both to the guardianship of his person and to the possession of his fee during his minority. An arrangement, however, was frequently made by which this right was commuted into an annual payment, in which case the fee was said to be held in *taxed ward.* When an unmarried vassal succeeded, the superior was entitled to a sum proportionate to the value of the estate, called the *avail of marriage;* and a larger sum, called the *double avail of marriage,* was due when the superior named a wife for his vassal, and the vassal, rejecting her, married another woman. If a vassal alienated his lands or the larger portion of them without consent of his superior, the fee fell to the superior by what was called the casualty of *recognition,* which was a check on vassals impoverishing themselves to such an extent as would render them unfit to perform feudal services. Wardholding was abolished by 20 Geo. II. c. 50, as a system hazardous to the public tranquillity.

WARDIAN CASES, close glass cases placed upon a trough containing soil, and accurately fitted to it, intended for the growth of plants in the windows of apartments.

WARDLAW, Ralph, d.d., b. 1779, a celebrated preacher and theologian in the roll of Scotch Independents, was a seceder by extraction, and studied in connection with the Associate Secession church. Before he had completed his curriculum, however, he had convinced himself that congregational independency was the scriptural system of church government. In 1800 he began to preach, and after some time settled in Glasgow as pastor of an Independent church. In 1811 he was appointed professor of theology to the Congregational body in Scotland, in conjunction with the Rev. Greville Ewing; an office he retained, along with his pastorate, to the period of his death, which happened on Dec. 17, 1853. Wardlaw's life was a very laborious and earnest one. Besides discharging faithfully and ably the duties of the pulpit and the professor's chair, he was a voluminous author, often involved in theological controversy, and a prominent actor in the public religious and philanthropical movements of the day. His intellect was acute, his understanding sound, and his style remarkable for its perspicacity, vigor, and grace. The most important of Wardlaw's works are: *Discourses on the Socinian Controversy* (1813); *Lectures on Ecclesiastes* (2 vols. 1821); *Essays on Assurance of Faith, and on the Extent of the Atonement and Universal Pardon* (1830); *Discourses on the Sabbath* (1832); *Christian Ethics* (1833); *Discourses on the Nature and Extent of the Atonement of Christ* (1843); *The Life of Joseph and the Last Years of Jacob* (1845); *Congregational Independency* (1848); *On Miracles* (1852), *Lectures on Systematic Theology* (1856).—See *Life and Correspondence of Ralph Wardlaw*, by Dr. Alexander (1856).

WARDSHIP, in English feudal law, was the guardianship which the feudal lord had of the land of his vassal while the latter was an infant or minor. Until the majority of the infant, the lord, out of the profits, provided a fit person to render the services incumbent on the vassal. See Tenure, Wardholding.

WARD'S ISLAND, a nearly circular island within the corporate limits of New York city, in the East river near its junction with Harlem river. It forms the n. boundary of Hell Gate. It contains about 200 acres, much of which is finely wooded. An extensive insane asylum for males is under the control of the New York commissioners of public charities and correction, while the commissioners of emigration have charge of the state emigrant hospital, lunatic asylum, houses of refuge and nursery or home for children. There is also on the island a home for invalid soldiers who served in the city regiments.

WARE, a co. in s. Georgia, containing Okefinokee swamp in the s. portion; 893 sq. m.; pop. '90, 8811. Co. seat, Waycross.

WARE, a town in Hampshire co., Mass.; on the Ware river and the Boston and Albany and the Boston and Maine railroads; 21 miles n.e. of Springfield. It was incorporated in 1761; contains the villages of Ware and West Ware; and has high and graded schools, free public library, electric lights, national and savings banks, weekly newspaper, and manufactories of cotton and woolen goods, hosiery, boots and shoes, wrought stone, etc. Pop. '90, 7329.

WARE, a small market t. in Herts, 2½ m. n.e. of Hertford. Malting, for which there are several establishments, most of them engaged in supplying the London breweries, is the principal employment. There is a silk-mill here and two large paper-mills, and there is a trade in malt, grain and coal. In one of the inns of the town is still to be seen the famous bed of Ware, for a notice of which, see Bed. Pop. '81, 5276; '91, 5121.

WARE, Henry, d.d., 1764–1845; b. Mass.; graduated at Harvard in 1785. He was pastor of the First church in Hingham, Mass., 1787–1805, when he was called to the Hollis professorship of divinity at Harvard college, where he remained till his death. During his residence at Cambridge the Congregational churches were divided into the groups known as Unitarian and Evangelical. Dr. Ware, with Drs. Norton and Channing, was one of the leaders of the former. He carried on a controversy with Dr. Woods, whom he answered in *Letters addressed to Trinitarians and Calvinists* (1820). He also published *Evidences, etc., of Christianity* (1842).

WARE, Henry, d.d., 1794–1843; b. Mass.; son of Henry. He was graduated at Harvard in 1812; was for a time an instructor in Phillips Exeter academy, and in 1817 was settled over the Second church (Unitarian) in Boston. He was professor of pulpit eloquence and pastoral care in the Harvard divinity school, 1830–42. He was one of the editors of the *Christian Disciple*, afterward the *Christian Examiner*, a Unitarian newspaper. Among his works are *Hints on Extemporaneous Preaching* (1824); and *Life of the Saviour* (1832).

WARE, William, 1797–1852; b. Mass.; son of the elder Henry. He was educated at Harvard college and the Harvard divinity school; was settled over Unitarian churches in Brooklyn, Conn., Burlington, Vt., New York, and Waltham, Mass., and retired from the ministry on account of ill-health. His historical novels, *Zenobia*, originally published in the *Knickerbocker Magazine* for 1837, as *Letters from Palmyra; Aurelian* (1838); and *Julian* (1841), had considerable reputation. He was for some years editor of the *Christian Examiner*.

WAREHAM, an exceedingly ancient though small t. of Dorsetshire, stands between the rivers Piddle and Frome, 15 m. nearly due e. from Dorchester. It was a British town, and afterward a Roman station, and is surrounded by a British vallum or rampart of earth, which, although extremely ancient, is still about 30 ft. high, and is perfect on three sides. The chief trade is the export of potter's clay; there are also breweries, malt-houses, and brick-fields. The borough comprises the parishes of Holy Trinity, Lady Saint Mary, Saint Martin Arne, Bere Regis, Corfe Castle, and parts of the parishes of East Stoke and Morden. Pop. '91, 2141.

WAREHOUSEMAN, in law, any person receiving goods and merchandise for storage only. As a bailee he is held only to use ordinary care, as the contract is one of mutual benefit. But he may assume full responsibility by special agreement. The same party may be a warehouseman in certain relations and a common carrier in others. Thus, if a railroad makes a contract to store certain merchandise until a fixed day and then to transport it, it becomes a common carrier (and practically, an insurer) upon that day, whether the goods are then moved or not. The warehouseman's lien is for storage of the particular goods only and not for a balance of accounts. It has been held that his liability begins when the crane is attached to goods which are yet outside the storehouse.

WAREHOUSING SYSTEM is a plan for lessening the pressure of excise or customs duties by postponing payment of them until the goods they are laid on pass to the consumer, or, at all events, to the retail dealer. A merchant who might import a thousand pounds' worth of wine or tobacco, if he only paid duty on it by installments as it went out to the dealer, would be quite unable to import so much if he had to pay somewhere from one to five thousand pounds of duty on its arrival. The system of bonded warehouses was hence adopted. The taxable commodity thus came to be locked up in a government warehouse, and the duty to be paid on its removal, along with a proportional fee or rent for the custody of the article, or its accommodation in government premises. Bonding in this manner was part of the scheme of sir Robert Walpole, in 1733, generally known as the excise scheme, which was defeated from its unpopularity. The system was first authorized by an act of George III. in 1802. When the customs laws were from time to time consolidated, the warehousing act formed a portion of the consolidation. In the consolidation of 1846 there was a separate "act for the warehousing of goods." In the latest consolidation of 1853 the warehousing system is embodied in clauses 41 to 113 inclusive of the general "customs consolidation act" (16 and 17 Vict. c. 107). This process, by which the crown holds in custody the goods of private persons, has produced some curious effects on mercantile law and trading practices. When transactions have taken place about bonded goods, should they be injured or destroyed, it may come to be a question of nice adjustment who is to bear the loss, seeing there is not possession to show ownership; and still nicer questions sometimes arise as to whether such goods are or are not part of a bankrupt estate. There is a difficulty in securing money upon goods without transferring their absolute possession, as in the case of pledging or pawning. The warehousing system, however, by retaining the goods for the owner, whoever he may be, has created a complete system of paper money in the transference of the title-deeds, as they may be called, of such goods—the dock-warrants or other documents—the possession of which is equivalent to possession of the goods.

WARFIELD, Catharine Anne (Ware), 1816–77; b. Washington, Miss.; daughter of Nath. A. Ware, secretary Mississippi territory (an author and writer on political economy), granddaughter of Capt. Charles Percy, of the British navy; educated at Philadelphia; married Elisha Warfield of Lexington, Ky., in 1833, and removed to a farm near Louisville. With her sister, Mrs. Eleanor Lee (d. 1850), she published *The Wife of Leon, and other Poems* (1843), under the *nom de plume* of "Two Sisters of the West." She was sole author of *The Household of Bouverie* (1860), new ed. 1875); other romances following annually; among them *Hester Howard's Temptation* (1875).

WARHAM, John, 1590–1670; b. England; was a distinguished Puritan minister at Exeter; came to Massachusetts in 1630; was with the Plymouth church, and was co-pastor with John Maverick; was settled at Dorchester; the church removed to Windsor, Conn., and the following year Mr. Warham followed and joined them.

WARING, George E., b. N. Y., 1833; for a time agricultural engineer of Central park, New York. He was col. of the 4th Missouri cavalry during the late civil conflict. Among his works are: *Whip and Spur; A Farmer's Vacation; The Bride of the Rhine;* and *Tyrol and the Spirit of the Alps.* He is a sanitary engineer of wide reputation, and has published *Sanitary Drainage of Houses and Towns.* In 1895 he was appointed by Mayor Strong commissioner of street cleaning in New York, and during his three years' term of office managed the department with great efficiency.

WARLOCK (written also warluck, from A. S. *wärloga*, "a breaker of his word or agreement"), denotes a male witch ; a wizard ; or sprite. See Witchcraft.

WARM-BLOODED ANIMALS. Under this title are included those vertebrates which possess a four-chambered heart and spongy lungs; the heart and lungs being so arranged that the whole of the venous or impure blood is propelled over the large but closely-packed capillary area of the lungs, by successive contractions of a special ventricle, receiving it from a distinct auricle (these being called the right or pulmonary ventricle and auricle), while the blood thus purified by the action of the air in the lungs is conveyed to another auricle, and propelled over the whole system by a second distinct ventricle (these being known as the left or somatic auricle and ventricle). The only animals which exhibit these structural peculiarities are mammals and birds. In man and in the ox the mean temperature of the interior of the body is 100°; in the mouse it is 99°; while in the whale it is 103°. In birds it ranges, in different species, from 106° to 112°. The warm-blooded animals present, however, gradations of their heat-making power. In the hibernating animals there is commonly a loss of heat of from 10° to 20° during their winter-sleep; and in the bat the temperature falls to 40°. In the cold-blooded animals, the fishes, amphibians, and reptiles, the temperature of the blood rarely exceeds that of the surrounding medium. See Birds and Mammalia.

WARMING and VENTILATION. Warming.—A certain temperature, constant within narrow limits, is essential for the life of warm-blooded animals, and the heat by which this temperature is maintained is produced by the vital actions of the body itself. See Animal Heat, Temperature of the Body. In the case of man, however, at least in ordinary climates, and in the civilized condition, the heat of the body, if allowed freely to escape, would be dissipated faster than it is produced; and hence arises the necessity of clothing, houses, and other means of retarding its escape. To allow the body to continue depressed in temperature beyond the natural state, instead of hardening, infallibly weakens its vitality, and sows the seeds of disease; and that this error is committed on a vast scale, in Britain more especially, is apparent enough. The reports of the registrar-general show that exactly as the thermometer sinks, the rate of mortality rises and certain diseases of the most fatal kind become more prevalent; the vitality, in short, of the community decreases as the warmth of the atmosphere decreases. Could this be if the means taken to arrest the waste of heat from our bodies, or to supplement it, were not, for the majority of men and women, insufficient, or injudiciously managed? This is a matter of literally "vital" moment to one and all. The economy of heat is a primary element in the art of living in health and comfort; and "no knowledge of common things" that we can think of can surpass in importance a right understanding of the principles and facts on which that art rests.

Where fuel is scarce the resource against the cold of winter is thick clothing indoors as well as out. This is said to be the regular practice in China; and even in the south of Europe fires are dispensed with in weather when we should think them absolutely necessary, and additional wrappings are considered as appropriate while sitting in the house as in the open air. But wherever fuel can be had, it is always preferred to wear within doors much the same clothing in winter as in summer, and to keep the apartments nearly at summer temperature by artificial heat. It is this special branch of the subject, viz., the artificial warming of apartments, that we are at present to consider; and in doing so, we presume the reader to be acquainted with the more general facts regarding the generation of heat by combustion, and its diffusion, as stated in the articles Combustion, Flame, Fuel, Heat.

The great aim, it may be premised, in all plans of warming is, as it is expressed by Dr. Arnott, "*to obtain everywhere on earth at will, the temperature most congenial to the human constitution, and air as pure as blows on a hill-top.*" The obtaining of the desired temperature would be comparatively easy by itself; the difficulty lies in combining warmth with pure air. Warming and ventilation are thus in some degree antagonistic operations, and are therefore best treated in one article. The various plans of warming hitherto tried may be classed under the four heads of the open fire, stoves, gas, steam and hot-water.

The Open Fire.—The first application of artificial warmth consisted, most likely, in lighting a fire of dried sticks and leaves in a grove, a cave, or other natural shelter. When tents or wigwams came to be erected, the fire would be lighted on the middle of the floor, with perhaps a hole in the roof for the smoke to escape by. This primitive arrangement may still be seen in some of the cabins of Ireland and the Scottish highlands. The Romans warmed their apartments chiefly by portable stoves or chafing-dishes, without any regular exit for the smoke and fumes; and a brasier of charcoal is still the chief means of heating sitting-rooms in Spain and Italy, which are in general without chimneys. The chimney (q.v.) is a modern invention.

The open coal-fire glowing in a grate, which is the prevalent mode of warming dwelling-houses in Britain, has an air of cheerfulness and comfort, and a power of concentrating the whole family in one social circle, that make it almost an object of worship; but it is not without serious drawbacks, the most serious of which is the waste of fuel it occasions. About one-half of the heat produced by a common fire ascends with the smoke—the black part of the smoke itself being an unconsumed part of the fuel—while about a fourth of the heat which is radiated into the apartment is, in ordinary circumstances, carried into the chimney between the fire and the mantel-piece, and thus lost. It was calculated by Dr. Arnott that only about one-eighth part of the heat-producing power of the fuel used in common fires is realized, all the rest being dissipated into the surrounding atmosphere. A common fire gives also a partial kind of warmth, heating the side of the body next to it, but leaving the rest cold; and it produces draughts into our rooms which are anything but safe or agreeable. Notwithstanding these and other acknowledged evils, the open fire continues to hold its place, partly perhaps from prejudice, partly from real points of superiority over other methods as yet practiced; and the object of late has been not so much to do it away, as to improve it.

Grates.—One improvement consists in diminishing the quantity of metal in immediate contact with the fuel, and forming the back and sides of the grate of fire-bricks. The bricks act like clothing, and keep in the heat of the coals, thus rendering the combustion more complete, and the fire far hotter; while iron, being a good conductor, runs away with the heat as fast as it is generated, and passes it into the wall, making the coals that touch it dull and black. The same quantity of fuel, therefore, burned in a brick-lined grate, not only produces more heat, but throws a greater proportion of that heat out into the room, and less up the flue and through the wall, than when it is surrounded by a mass of iron; for radiation depends more upon the intensity of heat than upon its quantity.

Another point deserving attention is the shape given to the chimney-mouth, or recess above the grate. When the sides are square with the back none of the heat falling on them is given out again into the room. With a view, therefore, to throw out the heat better, the sides, or *covins*, as they are called, are inclined to the back at an angle of about 130°; and sometimes they are made curved and of polished metal, in order that they may reflect the heat without absorbing it. It is questionable if simple brick slabs, placed at the proper angle, do not throw out more heat than the most splendid polished metal plates; for though the bricks do not reflect the rays of the fire, they become heated themselves, and then radiate their heat into the room. Plates of rough metal absorb the heat that falls upon them as the brick does; but being good conductors, the heat passes through them into the wall, and thus they never become hot enough to radiate sensibly.

Much also depends upon the shape of the fire-box, or grate itself. To see the importance of this, it is necessary to attend carefully to the exact way in which an open fire heats a room. It does so almost entirely by the rays of heat that it throws out; and these rays do not warm the air directly; they pass through it like light through glass, just as the hottest rays of the sun pass through the upper atmosphere, leaving it cold enough to freeze mercury. It is only when the rays of the fire fall on the floor, furniture, and walls of the room that they gave out their heat; and it is by coming in contact with these solid heated bodies that the air is gradually warmed. We may thus see the necessity of having a fire lighted and burning brightly for a considerable time before the hour when the apartment is expected to be comfortable.

The law that radiant heat neither affects nor is affected by the surrounding air, also explains the fact that an apartment may feel very cold, though the air in it be at high summer heat. A church or other massive stone building in frosty weather may be filled with artificially-heated air and yet retain its chilling effect for many hours. The warmth of the living body is lost in two ways: the film of colder air that touches it receives part of its heat by conduction, and, rising up, makes room for another film to do the same; a moderately heated body in cooling is robbed of about half its heat in this way. The other half is given off in rays, which pass through the air, and impinge upon the objects around. These objects are radiating back heat in return; but their temperature being low, the return is small, and the warmer body is colder by the difference. Hence we are chilled by a cold wall or a cold window without touching it, and though the air between us and it may be at 70°.—To return to the shape of the grate:

The chief object is to present as large a surface as possible of glowing fire to the front. With this view, the grate is made long and deep, in proportion to its width from front to back. This principle, however, is carried too far in many grates. The stratum of fuel is too thin to burn perfectly, especially in the narrow angles at the sides, where the coals seldom get to a red heat, and are only warm enough to distil away in smoke. Such fires are constantly going out, and are further from being economical than a square box.

The practice recently come into vogue of placing grates almost on a level with the floor, is also a mistake. The floor and the lower part of the person receive no share of the radiant heat.

The chimney-throat, instead of a gulf drawing in a constant wide current of the warm air of the room, and causing draughts from windows and doors toward the fireplace, should just be sufficient to admit the burned gases and smoke that come directly

from the fire, and no more. See CHIMNEY. This is the object of the movable plate in what are called *register-grates.*

It would be endless to attempt to enumerate the various forms of grate constructed with more or less success on the above principles. We shall content ourselves with a notice of the recent invention of the late Dr. Arnott, to whom the subject of warming apartments is more indebted than to any individual since the days of count Rumford. It comes nearer to the idea of perfection in an open fire-place than any previous contrivance. Its peculiar advantages will be understood from the following description:

Arnott's Smokeless Grate.—ab, ef (fig. 1), represent the front bars of a grate in a chimney of the usual construction, *rswu.* The grate has no bottom, and below it is an iron box, open only at top, into which the charge of coal for the day—from 20 to 30 lbs.—is put. Any kind of coke or coal may be used. To light the fire the usual quantity of wood is laid on the surface of the fresh coal at *ef,* and a thickness of 3 or 4 in. of cinders or coked coal, left from the fire of the preceding day, is laid over all. "The wood being then lighted, very rapidly ignites the cinder above, and at the same time the pitchy vapor from the fresh coal below rises through the wood-flame and cinders, and becomes heated sufficiently itself to become flame and so to augment the blaze. When the cinder is once fairly ignited, all the bitumen rising through it afterward burns, and the fire remains smokeless."

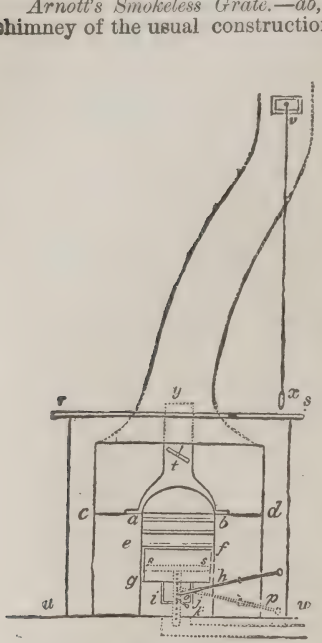


FIG. 1.

As there is no supply of air but through the bars in front, the box being close underneath, the fire must be gradually raised up as the combustion goes on; and this is effected by having a false bottom, *ss,* in the box, which can be moved like a piston by means of a rod. The rod has notches in it, and by means of the poker used as a lever can be raised up and then retained at any height by a ratchet-catch. When the piston comes level with the bottom bar of the grate, the coals may be replenished while the fire is burning by pushing in a flat shovel over the piston, so as to form a temporary bottom to the grate and support the fire, while the piston is allowed to descend to the bottom. The shovel is then raised up a little in front, or a part of the upper edge of the box is made to fold down, and fresh coals are shot into the box; on which the shovel is withdrawn and the combustion goes on as before.

"A remarkable and very valuable quality of this fire is its tenacity of life, so to speak, or its little tendency to be extinguished." Even after it sinks below the level of the box it does not go out, but continues to smolder slowly for a whole day or night, and is ready to burn up actively when the piston is raised.

Another peculiarity of the Arnott grate is the means taken to diminish the proportion of the heat usually carried up the chimney. Of the thick column of smoke that issues from a common chimney-can, only a small fraction is true smoke or burned air; the rest consists of the warmest air of the room, which becomes mixed with the true smoke in the large space usually left between the top of the fire and the throat of the chimney. "The whole of the air so contaminated, and which may be in volume twenty, fifty, or even a hundred times greater than that of the true smoke or burned air, is then all called smoke, and must all be allowed to ascend away from the room that none of the true smoke may remain. It is evident, then, that if a cover or hood of metal be placed over a fire, as represented by the letters *yab* in the diagram—or if, which is better, the space over the fire be equally contracted by brickwork, so as to prevent the diffusion of the true smoke or the entrance of pure air from around to mix with it, except just what is necessary to burn the inflammable gases which rise with the true smoke—there will be a great economy. This is done in the new fire-place with a saving of from one-third to one-half of the fuel required to maintain a desired temperature. In a room, the three dimensions of which are 15 ft., 13½ ft., and 12 ft., with two large windows, the coal burned to maintain a temperature of 65° in cold winter days has been 18 lbs. for 19 hours, or less than a pound per hour."—Arnott's *Warming and Ventilation.*

The hood is furnished with a throttle-valve or damper, *t,* having an external index showing its position, so as to give complete control over the current. The provision made for ventilation in this fire-place is considered further on.

Even in this, perhaps the most economical form of open fire yet contrived, there is still great waste of the heat actually produced by the combustion. To say nothing of what passes by conduction from the fire itself into the wall and is mostly lost, the quantity carried off in combination with the hot gases, though no more air is allowed to enter

than is necessary for complete combustion, is still great. It deserves being noticed that the proportion thus carried off is greatest in the case of fuel that burns with flame. Experiment shows that a fire of wood radiates one-quarter of its heat, the rest flying up; while the radiation from wood-charcoal is one-half of the whole heat produced. Every one has felt that a *blazing* fire has far less warming effect than a glowing one. Not that flame has not intense heat in it—more intense even than a glowing fire, but it gives it out only by contact and not by radiation. It thus appears that any mode of heating that depends upon direct radiation, as the open fireplace chiefly does, necessarily involves great waste of fuel. This can be avoided only by applying the heat on a different principle, which consists in first making the fire heat certain apparatus with considerable surface, which then by radiation and contact with the air of the apartment diffuses its heat throughout it. This is the principle of the other methods of warming, which we now proceed to describe. The consideration of methods that combine the two principles will come most conveniently last.

Warming by Stoves.—A *close stove* is simply an inclosure of metal, brick, or earthenware, which is heated by burning a fire within it, and then gives out its heat to the air by contact, and to surrounding objects by radiation. The simplest, and, so far as mere temperature is concerned, the most effective and economical of all warming arrangements, is what is called the Dutch stove; which is simply a hollow cylinder or other form of iron standing on the floor, close at top, and having bars near the bottom on which the fire rests. The door by which the coals are put in being kept shut, the air for combustion enters below the grate, and a pipe issuing from near the top carries the smoke into a flue in the wall. If this pipe is made long enough by giving it, if necessary, one or more bends, the heated gases from the fire may be made to give out nearly all their heat into the metal before they enter the wall; and thus the whole heat of the combustion remains in the room.

The great objection to this form of stove is that the metal is apt to become overheated, which not only gives rise to accidents, but has a hurtful effect upon the air. The exact nature of the change that highly heated metal produces upon air is not very well understood. It cannot be said to burn it, in the proper sense of the word, for none of its oxygen is abstracted, but it gives it a peculiar odor, which is both unpleasant and unwholesome. This is thought to arise in some measure at least from the hot iron burning the particles of dust that light on it, which particles consist of organic matter, such as wool, wood, etc.

Part at least of the unwholesomeness of air so heated arises from its excessive dryness; it parches and withers everything it touches, like the African simoom. It must not, however, be supposed that this is peculiar to air heated by contact with metal; *air suddenly heated is always unwholesomely dry.* This is an important point in regard to the subject of warming, and requires consideration. A cubic foot of air, say at 32°, can contain a certain quantity of moisture and no more; but if heated to 80°, it is capable of containing *five* times as much, and has thus become *thirsty*, and drinks up moisture from everything that contains any. The heating of air, therefore, does not dry it, in the sense of taking moisture from it, it only renders it greedier of more; and this is equally true whether it is heated by a stove or an open fire. The chief difference is that in the latter case the warming is more gradual, and no part of the air becomes very highly heated; while the air that touches a metal plate near redness is all at once rendered intensely thirsty, and, before its fierceness is tempered by thoroughly mixing with the rest of the atmosphere of the room, must be highly pernicious. But whenever the temperature within doors is much higher than without, the air is in a too thirsty state, and parches the skin and lungs, unless means be taken to supply the necessary moisture. *An evaporating pan or other contrivance is an essential part of warming apparatus;* it is specially necessary to attend to this during e. winds, which are generally too dry even at their natural temperature.

All improvements on this simple and rude form of stove aim at avoiding a high heat in the warming surface, and this chiefly by lining the fire-box with brick, and inclosing it in several casings, so as to enlarge the heated surface. In the kind of stove called a *cockle*, the fire is burned in a small furnace within the inner case, and the air is warmed by circulating between the inner and outer cases. When placed in the apartment or hall to be warmed, the outer casing has perforations about the top for the issue of the warm air. For heating churches and similar buildings, the stove is placed in a separate furnace-room, and the warm air is conveyed to the different parts of the building in pipes or flues, while fresh air is drawn to the stove through a channel or culvert leading from outside the building to the openings in the outer casing.

The stove invented by Dr. Arnott is upon the same principle of an extensive and moderately warm heating surface. Under a sense of professional honor, Dr. Arnott did not take out a patent for his stove; it was therefore made by many furnishing ironmongers in the metropolis and elsewhere, some of whom took out patents for what they considered as improvements upon it. No fewer than 12 patents were taken out in one year for modifications of this stove, *all of which Dr. Arnott considered to be upon false principles.* The consequence has been that many Arnott stoves, which had been introduced into houses, have been given up on account of the inconvenience felt from the species of heat which they generated. It is also, however, to be observed that the stove,

made even upon the most approved principles, requires certain adjuncts and conditions in order to operate healthfully and agreeably.

The accompanying figure represents the Arnott stove in the most improved form given to it by the inventor. We give the description in his own words: "The complete self-regulating stove may indeed be considered as a close stove, with an external case, and certain additions and modifications now to be described. The dotted lines and small letters mark the internal stove, and the entire lines, the external case or covering. The letters ABCD mark the external case, which prevents the intense heat of the inner stove, *abcd*, from damaging the air of the room. F is the regulating-valve, for admitting the air to feed the fire. It may be placed near the ash-pit door, or wherever more convenient. The letters *ff* mark the fire-brick lining of the fire-box or grate, which prevents such cooling of the ignited mass as might interfere with the steady combustion. H is a hopper, or receptacle with open mouth below, suspended above the fire like a bell, to hold a sufficient charge of coal for 24 hours or more, which coal always falls down of itself, as that below it in the fire-box is consumed. The hopper may at any time be refilled with coal from above, through the lid, *k*, of the hopper, and the other lid, K, of the outer case. These lids are rendered nearly air-tight by sand-joints; that is, by their outer edges or circumference being turned down, and made to dip into grooves filled with sand, as at *e*, *e*. The burned air or smoke from the fire, M, rises up in the space between the hopper and the inner stove-case, to pass away by the internal flue, *x*, into the other flue, X, of the outer case. L is the ash-pit under the fire-bars. G is the ash-pit door, which must be carefully fitted to shut in an air-tight manner, by grinding its face or otherwise. M is the coal intensely ignited below where the fresh air maintains combustion, but colder gradually as it is further up. Only the coal in the fire-grate below, where the fresh air has access to it through the fire-bars, can be in a state of active combustion." The self-regulating valve above mentioned is an ingenious contrivance by which the passage for the air is rendered narrower according to the force of the draught. Dr. Arnott describes various other plans of effecting the self-regulation of the combustion.

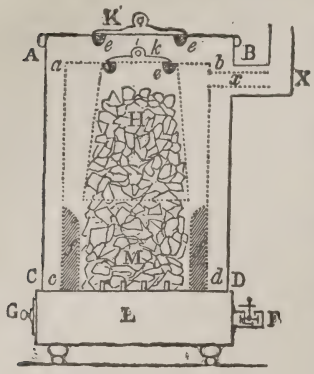


Fig. 2.

A drawer inserted into the heated chamber of the stove would serve for cooking meat, and a pot for boiling might be placed upon the fire box; it is, therefore, as the inventor remarks, peculiarly the *poor man's* stove. Or, by making the space between the two casings water-tight, a *water-stove* is produced, which, besides securing a regulated heat, offers many other conveniences.

In Russia, many parts of Germany, and other northern countries of Europe, the stoves are usually built of brick, covered with porcelain. They are of the size of a large and very high chest of drawers, and usually stand in a corner of the room. The fire is burned in a furnace near the bottom, and the heated smoke is made repeatedly to traverse the structure from side to side, along a winding passage, before it reaches the top, where a pipe conveys it, now comparatively cold, into a flue in the wall. The heated mass of brick continues to warm the room long after the fuel is burned. It is generally sufficient to warm the stove once a day. The same quantity of wood burned in an open grate would be consumed in an hour, and would hardly be felt.

Open-fire Stoves.—As a specimen of the numerous plans for combining the advantages of the stove and the open fire, we may take Sylvester's stove or grate, which is thus described in Ronalds and Richardson's *Technology:* "The fuel is placed upon a grate, the bars of which are even with the floor of the room. The sides and top of these stoves are constructed of double casings of iron, and in the sides a series of vertical plates, parallel with the front facing, are included in the interior, which collect, by conduction, a great portion of the heat generated from the fire—the mass of metal of which these are composed being so proportioned to the fuel consumed that the whole can never rise above the temperature of 212° Fahr. under any circumstances. The sides and top of the stove are thus converted into a hot chamber, offering an extensive surface of heated metal; at the bottom, by an opening in the ornamental part, the air is allowed to enter, and rises as it becomes warmed, traversing in its ascent the different compartments formed by the hot parallel plates, and is allowed to escape at the top by some similar opening into the room." The Sylvester stove can either be placed in an ordinary chimney recess or be made to stand ornamentally forward into the room. The feeding-draught may be either taken directly from the apartment or brought by flues from the outside of the building.

The idea of having an air-chamber behind and around the fire-place, from which warm air would issue into the room, thus saving part at least of the vast amount of heat that is lost by passing through the wall, is not new, having been put in practice by the

cardinal Polignac in the beginning of last century. But the way to carry the principle out to the full would be to have the open fire-place in a pier of masonry standing isolated from the wall, like a German porcelain stove. A very small fire would keep the whole mass mildly heated. The pier could receive any shape, so as to give it architectural effect; and it might either terminate in the room—the smoke, after parting with most of its heat, being conducted by a pipe into the wall—or it might be continued into the story above, where its heat would still be sufficient to warm a bedroom. An Arnott smokeless grate, set in the pedestal of an ornamental column, which might either stand in front of the wall or in a niche in its depth, might be made the *beau-ideal* of comfort, economy, and elegance.

Warming by Gas.—A prejudice arose against gas as a medium of heat, from the first attempts to employ it being made in an unskillful way. But when care is taken to carry off the products of combustion by a pipe, and to prevent overheating, gas-stoves will be found economical and pleasant, and capable of being used in situations where a common stove is inadmissible.

In stoves gas should always be burned with the Bunsen burner, which is generally employed by chemists when they make use of gas for heating purposes. It consists of a small brass cylinder, or chimney, set over the gas-jet, like the glass of an argand lamp, with openings near the bottom to allow air to enter. The gas being admitted into this before lighting, mixes with the air, and when lighted at the top, which is usually covered with wire-gauze or perforated metal, burns with a pale-blue flame. The most complete combustion and the greatest heat are obtained in this way. Smoke, properly so called, there is none. Still, it must not be forgot that there is burned air—a cubic foot of carbonic acid, besides a quantity of watery vapor, for every cubic foot of gas used; and, therefore, even with the Bunsen burner, these gaseous products should, wherever it is possible, be conducted away.

A pleasant and very serviceable gas-stove might be constructed by making the casing double, to contain water. It has been ascertained that a gallon of water may be brought to the boiling point in 20 minutes by burning 4 cubic ft. of gas, which, at 4s. 6d. per 1000 ft., costs less than a farthing. The cost of doing the same by a newly-lighted coal-fire is more than threefold.

Steam and Hot Water.—The immediate warming agent in these two methods is the same as in Arnott's and other low-temperature stoves—viz., an extensive metallic surface moderately heated; but instead of heating these surfaces by direct contact with the fire, the heat is first communicated to water or steam, and thence to the metal of a system of pipes. This affords great facility in distributing the heat at will over all parts of a building; and these methods are peculiarly adapted to factories, workshops, and other large establishments. Other advantages are—freedom from dust, and from all risk of overheating and ignition.

Steam.—Steam-warming is generally adopted in establishments where steam-power is used, as the same boiler and furnace serve both purposes. When steam enters a cold vessel it is condensed into water, and at the same time gives out its latent heat till the vessel is raised to 212°, when the condensation ceases. The condensing vessel is usually a cast-iron pipe placed round the wall of the apartment near the floor. In admitting fresh air into the room it may be made to pass over this pipe, and thus be warmed. The steam is conducted from the boiler by a smaller tube, which may be covered with list or other material, to prevent all condensation by the way; and the admission of the steam is regulated by a cock within the apartment, means being provided for allowing the air to escape. Where a pipe cannot be laid round the room, a coil of pipe may be formed, or the steam may be admitted into a large vessel or into a hollow statue, forming a steam-stove. Allowance must be made for the expansion of the tubes by heat; and they are so arranged that the condensed water is conveyed back to the boiler.

There can be no proper comparison between this plan of heating and that of common fire-places. Coal-fires cannot warm the air in large workshops; the heat is confined to their own immediate neighborhood; hence the workmen are often obliged to draw near the grate to warm themselves. According to the plan here adopted every part of the house is equally heated, and the whole of the workmen are as comfortable during the hardest frosts as if they were working in a pleasant summer day. It is difficult to estimate the expense of supplying the heat, seeing that the steam happens to be drawn from a boiler which is always in operation for other purposes. Excellent, however, as the process is, it is for many reasons unsuited to private dwelling-houses.

In calculating how much surface of steam-pipe will be sufficient to warm a room, it is customary to allow about 1 foot square for every 6 ft. of single glass window, of usual thickness; as much for every 120 ft. of wall, roof, and ceiling, of ordinary material and thickness; and as much for every 6 cubic ft. of hot air escaping per minute as ventilation, and replaced by cold air.

Hot Water.—Hot-water apparatus was applied as early as 1777 by M. Bonnemain, in Paris, to warm the hot-houses at the Jardin des Plantes, as well as for the artificial hatching of chickens. It was first introduced into England by the Marquis de Chabannes in 1816, and is now used in many large buildings. It is more economical than steam, except where a steam-boiler is required for machinery; and from this and other

advantages it is generally preferred to steam-apparatus. One of these advantages is that the heat begins to be distributed, in some degree, as soon as the fire is lighted, while with steam-apparatus the whole of the water must be at boiling-heat before any steam enters the pipes.

There are two kinds of hot-water apparatus—high-pressure and low pressure. In the first the water is confined, and can be heated to any degree; in the other it is open to the air, and cannot be heated above 212°. Fig. 3 will explain the way in which water is made to carry the heat of a furnace to any part of a building by the low-pressure method. *a* is a boiler, from the top of which a tube issues, and after circulating through the building, re-enters near the bottom. At the top of the circuit there is a funnel, or a small cistern, *c*, by which the tubes and boiler may be kept full. When the fire is lighted at the bottom of the boiler, the heated portion of water, being lighter than the rest, rises toward the top through the tube *bb*, while the colder water from *dd* flows in to take its place. The tube is made to traverse the apartments to be warmed, where it gives out its heat to the air; the returning portion of the pipe is thus always colder and therefore heavier than the other, so that the circulation is constantly kept up. The warming surface is increased, wherever it is necessary, by coiling the pipe, or by making expansions upon it of various forms, so as to constitute water-stoves.

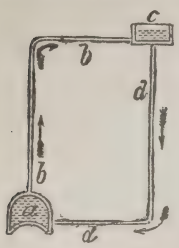


Fig. 3.

To avoid the necessity of so large a surface, and such a mass of water as is required at the low-temperature the water attains in the pipes of this kind of apparatus, Mr. Perkins introduced the high-pressure system. In this the pipe is made comparatively small, but very strong, and is formed into an endless circuit cut off from the atmosphere. The water is heated by making a number of coils of the pipe itself pass through the furnace; and as the whole circuit forms a shut vessel, as it were, the temperature may be raised to 300° and upward, according to the strength of the pipes. This high temperature causes a rapid circulation. In filling the tube with water care is taken to expel all the air; and at the top of the system there is an expansion of the tube, equal to 15 or 20 per cent of the capacity of the whole, which is left empty both of water and air, to allow for the expansion of the water when heated. The arrangement of the pipe may be various: the plan generally followed is to place a considerable coil of it within a pedestal or bunker, with open trellis-work in front, in a convenient part of the room. It may also be made to wind round the room, behind the skirting-board, which, being perforated with holes, will allow of the entrance of the warmed air.

Electricity.—The method of heating by electricity, although not as yet very generally adopted, except in special cases, has attracted great attention during the last few years, in which time it has been largely experimented upon and reduced to a thoroughly practical system. Electric heaters are simply a number of wires of high electrical resistance which become heated on the passage of a current through them. These are incased in fire clay, asbestos, or other similar materials, which retain their heat for some time. (See Electric Heating.) Heaters of this character are very generally used on electric railway cars, and their use is gradually extending in other directions.

Conservation of Warmth.—The art of warming embraces not only the production and distribution of heat, but the construction of apartments with a view to prevent its escape. The way to effect this—setting aside in the meantime the necessity of renewing the air—is, in the first place, to make the walls, floor, windows, doors, etc., as impervious to air as possible, to prevent the heat from being carried off by currents; and in the next place, to make them bad conductors of heat. For this last purpose, the walls ought to be sufficiently thick, and, if possible, built of non-conducting materials. Solid iron would make a cold wall; wood, a warm one; and in this respect brick or porous stone is preferable to hard stone. But the chief element in a warm wall is that it be *double*, which every wall in effect is when it is lined by a coating of plaster, kept apart from the wall itself by the laths. The plate of confined air between the two is the most effectual barrier to the passage of heat outward that could be contrived. By making iron walls double or cellular, with a lining of plaster, they might be rendered as warm as wished. Windows are a great source of cold, not merely by admitting cold air, but by allowing the heat to pass by conduction through the thin glass. The air of the room that touches the window is robbed of its warmth, and is constantly descending in a cold stream toward the floor. There is thus a cold influence felt from a window, however close it is. This is partly arrested by window-blinds, shutters, and curtains, which check the flow of the air, and retard its carrrying power. But a far more effectual plan is to have double windows: either two frames, or double panes in the same frame. The loss of heat by a double window is said to be only one-fourth of that by a single. Double windows are considered essential in countries where the winters are rigorous.

By carrying those principles far enough, we might succeed in well-nigh imprisoning the heat, and thus produce a house of ideal perfection, so far as mere temperature is concerned. But for the habitation of living beings another condition, seemingly antagonistic to the former, is no less requisite—"air as free as that on a mountain-top."

In general practice the two hostile conditions are not so much sought to be reconciled as compromised; and then, as usual, neither object is well attained. Circulation of air is got accidentally, through the imperfections of structure in our rooms—through the chinks and bad fittings of the windows, doors, floors, and the uneconomical fashion of our fire-places. Were houses much better constructed than they are, the inmates would in many cases be suffocated outright, as they often partially are with the degree of perfection we have already attained. Neither the airing of our houses, nor the art of building them solid and warm, can advance to perfection until the former be no longer left to chance, but be in every case secured by special apparatus capable of direct control. We now proceed to consider how this is sought to be attained; confining ourselves still to the leading principles, and only noticing a few of the specific plans that have been put in practice.

Ventilation.—The necessity of constantly renewing the air wherever living beings are breathing, arises chiefly from the effects produced upon air in the lungs (see Respiration). The average quantity of carbonic acid in expired air or breath is found to be 4.3 per cent by measure. Now this gas, when taken into the lungs, is a poison, and tends to arrest the vital processes. Like other poisons, however, it can be rendered harmless by *dilution*. The small proportion naturally existing in the atmosphere is perfectly innocuous, and may be considerably increased without sensible effect. But it is decidedly prejudicial to breathe for a long time air containing 1 measure in 100 of carbonic acid; and it is considered desirable that the proportion should never exceed 1 in 500. We may assume, then, what is near the truth, that 20 cubic ft. of air pass through the lungs of a man in an hour. To reduce the poison of this to 1 per cent, at which point it is barely respirable, it requires to mingle with as much fresh air as will make a mixture of nearly 100 cubic feet; and to make the dilution at all safe, it must be carried five times as far. In other words, the respiration of one human being vitiates hourly about 500 cubic ft. of air.

In addition to carbonic acid, expired air contains an undue amount of watery vapor. Minute quantities of animal matters are also exhaled with the breath, which in close, ill-ventilated apartments form a clammy deposit on the furniture and walls, and, by putrefying, become organic poisons.

A further necessity for the constant renewal of fresh air arises wherever lights are burned. The deteriorated air of a fire goes off by the flue, but lights are generally burned where the product must mingle with the atmosphere of the apartment. Now, a pound of oil in burning consumes the oxygen of 13 ft. of air, and produces a large amount of water in vapor, and also of carbonic acid. Every cubic foot of gas consumes the oxygen of 10 ft. of air, and forms at least 1 foot of carbonic acid, besides watery vapor, sometimes mixed with sulphurous fumes.

To counteract these various sources of pollution, and keep the air sufficiently fresh and wholesome, in rooms where many persons are breathing, it is found in practice that on an average about 20 cubic ft. of fresh air per minute for each individual must be supplied.

Ventilation consists of two operations—the removal of the foul air, and the introduction of fresh. Though neither operation can go on without the other going on at the same time, it is convenient to consider the two separately.

The agents employed in removing the air from apartments are chiefly two: that by which nature effects the ventilation of the earth on a grand scale, viz., the draught of ascending currents produced by difference of temperature; and mechanical force, such as pumping. The former is the more common, and is the only one applicable to private houses.

The column of air in the chimney of a lighted fire-place being expanded and comparatively light, exerts less than the prevailing pressure on the air immediately under and about its base. The air, therefore, below and around it pushes it up, and flows in to take its place; the velocity of the movement being in proportion to the height of the chimney and the degree of heat. Thus, although it is often convenient to speak of the air being *drawn* or *sucked* into the chimney, the force does not lie in the chimney, but in the greater pressure of the air behind.

Wherever, then, there is a heated chimney, there is a means of removing the foul air. And in rooms moderately lofty and spacious, with windows and other fittings not closer than usual, and a chimney mouth of the usual width, there is little risk, when there are only a few inmates, of any serious vitiation of the air. The heated breath that ascends to the ceiling has time to diffuse itself gradually, and be drawn in a diluted state into the currents that are setting from all quarters toward the chimney. These currents, however, are one great objection to this mode of ventilation, as they consist in great part of cold air that has just entered by the doors and windows, and are strongest where the inmates sit to enjoy the fire.

The ascent of foul air to the top of the room dictates its exit in that direction, rather than low down at the mouth of the chimney. It is conceived by some that the carbonic acid of the breath, from its greater weight, must be chiefly at the bottom of the room; but this is a mistake. The heated breath ascends instantly, because it is, as a whole, lighter than the air around it; and the carbonic acid in it does not tend to separate from it and fall down by its superior weight, but, by the law of the diffusion of gases, seeks

to spread itself equally all over the room, and would do so though it were lying at first on the floor. It is on the principle of the foul air ascending at first to the top of a room, that Dr. Arnott's ventilating-valve is contrived. The valve may be used to supplement the open-fire draught in small and crowded apartments, and is essential where the fire is burned in a close stove or in the smokeless grate. The valve is represented at *v*, fig. 1. An aperture is cut in the wall over the chimney, as near to the ceiling of the apartment as may be convenient. In this is suspended a valve, capable of opening inward to the chimney, but not in the other direction, by which means a return of smoke is prevented. The valve is so balanced on its center of motion, that it settles in the closed position, but is easily opened. A flap of 36 sq.in. is sufficient, where there is good chimney-draught, for a full-sized room with company. This simple apparatus may be painted or otherwise made ornamental. It operates by virtue of the draught in the chimney. Whenever that is active from the presence of a fire, the valve is seen to open inward, and a stream of air from the top of the apartment passes through into the chimney, and is carried off. The operation is precisely equivalent to the stream of air always passing into a chimney between the fire and the mantel-piece, but has the great superiority of draining off the most impure air in the room. A wire descends to a screw or peg fixed in the wall, by which the opening of the valve may be limited or altogether prevented. This is a far more efficient plan of ventilation than an open window, or an opening in the wall near the roof, leading merely to the outer air; where there is an open fire in the room, such openings rather admit a rush of cold air than let out the foul.

There is generally more or less draught in a chimney, even without a fire, from the air within being slightly warmer than that without; and this action might be strengthened by burning a jet of gas within the ventilating aperture at *v*. Where a house is to be built new, some recommend having special ventilating-flues in the walls, separate from but close to the fire-flues, so that the air may be heated, and an ascending current produced. In weather when fires are not required, the draught can be maintained by gas-jets at the entrances to the vents. This plan of causing a draught by gas is applicable to churches and apartments without fire-places.

Where a fire is burned for the express purpose of producing a current of air, it is called ventilation by *fire-draught*. The plan has been exemplified with success in mines, where a fire being lighted at the bottom of a shaft, air is drawn off in all directions around, and sent up the shaft; to replace which, fresh air is constantly pouring down other shafts.

Many of our large buildings are ventilated by fire-draught. A school or church may be ventilated by having the flooring perforated with holes, through which air, warmed by hot-water pipes, passes to the interior. The ceiling is perforated, leading to a chamber which communicates with a vertical flue which leads to the fireplace of the warming-apparatus, situated at the foot of a flue. As the only air which reaches this must pass from the vertical flue, a constant current is maintained therein, and also through the apertures in the ceiling. Dr. Reid exemplified this method, first in his own class-room in Edinburgh, and afterward in various public buildings, among others, in the temporary house of commons, erected after the burning of the old house in 1834. The plan was attended with some inconveniences—in fact, no plan can meet every contingency—but, notwithstanding the storm of hostile criticism that was raised at the time, Prof. Tomlinson (*Treatise on Warming and Ventilation*, 1864) gives it as his opinion that "in the case of the temporary house of commons, where all the arrangements were left in his own hands, he succeeded in the proposed object of removing the vitiated air, and keeping up a constant supply of warm or of cool air to fill its place." The arrangements for warming and ventilating the English house of commons are a modification of Dr. Reid's plan.

In other cases, as at the prison in Millbank, warm air is admitted at the ceiling, and carried off by the draught of a chimney in connection with the sides or lower part of the rooms.

In these last-mentioned instances, the apparatus provides as well for the admission as for the removal of air. In ordinary dwellings no special provision is in general made as to admission. It is, in fact, not absolutely necessary; for the removal of a portion of the air of a room never fails to secure the entrance of a fresh supply somewhere. Whenever the chimney-draught or other means removes a little of the pressure inside the room, the pressure without forces air through every opening and chink; and even, were there no actual openings, would force it through the porous substance of the structure—such as mortar, and even wood itself. But this irregular source of supply has various inconveniences. It often requires more force to strain the air in this manner than the draught is possessed of, and then the chimney smokes; it is smoke produced by this cause that is curable by opening the door or window. Another objection is that impure air is often thus drawn into rooms from the lower parts of the building and from drains about the foundation. For these and other reasons there ought, in all cases, to be a free and legitimate entrance provided for fresh air, so as to give a control over it; and this entrance should be independent of the windows. It is a much disputed point whereabout in a room the air should be made to enter—some advocating openings for it near the floor, others near the ceiling; and it must be confessed that neither method has yet been rendered unobjectionable. One essential thing is to prevent the air from rushing

in with a strong current, by passing it through minute holes spread over a large space. A tube, for instance, leads from the outer air to a channel behind the skirting, or behind the cornice, and the air is allowed to issue into the room through minute holes, or through a long, narrow, and concealed opening covered with perforated zinc or wire gauze. The passage or tube leading from outside the wall can be more or less closed by a valve regulated from the inside.

But the great difficulty lies in the coldness of the air directly introduced from the outside, whether by the doors and windows, or through channels in the walls, and all such plans of ventilation must be considered as imperfect makeshifts. The fresh air ought in every case to be warmed before being admitted, or, at least, before being allowed to circulate in a sitting-room. In the smokeless grate (fig. 1) the air is led directly from the outer atmosphere into a channel underneath the hearth, and escaping below the fender and about the fire, is warmed before spreading through the apartment. With stoves and heated pipes, the air should enter about the heated surface; in stoves on the cockle principle, the fresh air, as it enters, is made to pass between the casings of the stove. With an open fire a very feasible plan is to make the fresh-air channel pass behind the fire-place, and allow the warmed air to escape from concealed openings about the chimney-piece and jambs, or from behind the skirting. In Condy's ventilating-grate, the fire-box is constructed of hollow pieces of fire-brick communicating with the external atmosphere and with the room.

For a house with fire-places of the usual construction, perhaps the simplest and most effective expedient is to admit the fresh air into the entrance-hall, and there warm it by means of a low-temperature stove or by hot-water pipes: its passage into the several rooms can then be provided for by regular channels, behind the skirting or otherwise. In America perforations are frequently made in certain parts of the doors, before which silk curtains are disposed, so as to temper the currents. It is almost unaccountable that in this country the plan of warming the lobby and staircase is so seldom resorted to. To say nothing of the comfort thus diffused through the whole house, and the benefit in point of health, especially to weakly constitutions, the economy of the arrangement is beyond dispute. In the sitting-rooms, not more than one-half the usual quantity of fuel requires to be burned in the open fires; and in the bedrooms, as a rule, fires are rendered altogether unnecessary in the coldest weather. It ought to be observed that when air is admitted by a regular and free channel, comparatively little is strained in by the windows and other byways.

Ventilation by Fans and Pumps.—The fan-wheel has been for many years used in factories, to which it is particularly applicable, from the readiness with which it can be kept in motion by the engine. It is essentially the same as the barn-fanners; the air is drawn in at the center of the wheel, and flies off at the circumference by centrifugal force. The fan is placed at the top of a flue, into which branches from all parts of the establishment proceed; and when it is set in motion, it draws off the air from every apartment communicating with it. Dr. Arnott observed that in the fan-wheel as well as in the air-pump or bellows invented by Dr. Hales, a great deal of power was wasted by "wire-drawing" the air—that is, making it squirt through small valves or other narrow openings. To obviate this, he invented a ventilating-pump, which supplied a hospital with fresh air, requiring no other motive power than the descent of the water used in the establishment from a high reservoir to the lower parts of the building. It is described in his work on *Warming and Ventilation.*

Transference of heat from the used air to the fresh.—This is the kind of economy which is put in practice in the respirator (q.v.) and in the caloric engine (q.v.). Whatever difficulties—or impossibilities, as some maintain—there may be in the way of turning this transferred heat into a fresh source of power, nothing seems simpler, in theory at least, than to economize heat in this manner for the warming of dwellings and similar purposes. The idea originated with Dr. Arnott, many years ago, who thus illustrates it in the case of water: Suppose a vessel of boiling water, with a thin metallic tube issuing from the bottom, and having a stop-cock at its extremity; and a similar vessel of water at freezing, the tube of which is larger, and envelopes the other. When both are flowing simultaneously, the hot water, if the tube is long enough, will have lost all its excess of heat before getting to the end of the tube, while the counter-current will have gained all that the other lost. In an experiment with tubes 6 ft. long, the boiling water from the first vessel issued from the pipe at 34°, and the freezing water from the second vessel issued from the pipe at 210°. It is clear that if the first vessel were a bath, the warm water in it, after being used, might in flowing out be made to heat the cold water from a reservoir, flowing into another bath below. We are not aware that the principle has ever been acted upon; but the possible economy of heat is obvious, and it only requires mechanical ingenuity to realize it.

It will at once strike the reader how desirable it would be to do the same with the impure heated air which we are obliged to eject from our dwellings. Where the ventilation depends upon the draught of a common chimney, it would seem impossible to bring the entering air in contact with that which is escaping; but where the mechanical force of a pump or a fan is employed, nothing seems simpler than to make the two currents run counter to one another for a certain distance in close contact through a system of tubes. The smoke even, which, with the most economical arrangements, still issues

from the flues at a temperature considerably above that of the building, might be drawn into the current along with the foul air of the apartments, and the whole reduced nearly to the temperature of the atmosphere before being allowed to escape. Of course there must be loss in the transference; but a large percentage would be saved, and the consumption of fuel would be reduced by that amount. Were this "double-current ventilation" applied to churches, ball-rooms, theaters, etc., where thousands of persons are assembled, Dr. Arnott believed that "no other heating apparatus would be required but the lungs of the company."

Notwithstanding all the improvements recently effected, it is beyond doubt that this important branch of the art of living is still in a very rude and imperfect condition. A writer in the *Quarterly Review* for April, 1866, in a very suggestive article on *Coal and Smoke*, points to the radical error of the existing system, when he remarks that "in a household fire heat is, as it were, manufactured on a very small scale; and experience has proved that the cost of production of an article has always been inversely proportionate to the scale of its manufacture." He accordingly suggests that "it seems practicable, in a great measure, to supersede domestic fires, and to lay on heat (heated air), or the means of generating heat (low-priced gaseous fuel), to our houses pretty much as we now lay on gas." The abatement of the smoke nuisance, and systematic and thorough ventilation, ought to be effected on a similar joint-plan, "by connecting the chimneys of all the houses with underground culverts, provided at intervals with high shafts, in which, if necessary, the draught upward might be increased by furnaces. We have long been familiar with extensive manufactories, covering large areas, in which are very numerous fires, all in communication with a single lofty chimney. With such an arrangement, no visible smoke should be produced, and with due attention a smoky chimney should be impossible." Regarding the subject in its aspect as to health, it may be assumed that no system of heating is advisable which does not provide for a constant renewal of the air in the locality warmed. All heating apparatus depends upon the transference of heat from the fire to the various parts of the building which it is intended to warm, and this transfer may be effected by radiation, by conduction, or by convection. Radiant heat is emitted and absorbed in an accelerating ratio in proportion as the difference of temperature between the radiant and the recipient increases; and, with the same difference of temperature between the recipient and the radiant, the effect of the radiant will be greater according to the increased temperature of the recipient. In other words, the ratio of the emission of heat increases with the temperature. It is thus easier to effect the warming of a given space by means of a highly-heated surface than by a surface emitting a lower temperature. An open fire acts by radiation; it warms the air in a room by first warming the walls, floor, ceiling, and articles in the room, and these in their turn warm the air. Therefore, in a room with an open fire the air of the room is, as a rule, less heated than the walls. In this case the warming of the air depends on the capacity of the surfaces to absorb or emit heat; except that the heat received by the wall may be divided into two parts, one heating the air in contact with the wall, and the other passing through the wall to the outer surfaces, where it is finally dissipated and wasted. Fire-places are sometimes constructed to assist the warming of the air of a room. For instance, in Sylvester's grate, iron bars, of which one end terminates under the fire, are laid so as to form a projecting radiating hearth. The ventilating fire-place warms the fresh air before its admission into the room by means of gills cast on the back of the grate. In a close stove, heated to a moderate temperature, the heat as it passes from the fire warms the surface of the materials which inclose and are in contact with the fire and the heated gases. The materials next transfer the heat to the outer surface in contact with the air, and the air is warmed by the agency of this outer surface. If heated to a high temperature a stove gives out radiant heat, which passes through the air to warm the objects on which the rays impinge. With hot-water pipes, the heat from the water heats the inner surface of the pipe, and this surface transfers its heat to the outer surface through the material of the pipes. The rate at which the heat can pass from the inner to the outer surface, and be thus utilized instead of passing away straight into the chimney, depends on the heat evolved by the fire, on the extent of surfaces exposed to the heat and their capacity to absorb and emit heat, and on the quality of the material between the inner and outer surfaces as a good or bad conductor of heat. This passage of heat through a body by conduction varies directly with the quality of material, and with the difference between the temperature of the inner surface exposed to the heat and the outer surface exposed to a cooling influence, and inversely as the thickness between the surfaces. Other things being equal, copper is a better material than iron for conveying the heat from the fire to water or air; and coverings of brick-work, wood, or woolen fabrics are better adapted than iron for retaining the heat. The property which appears more than any other to make materials good non-conductors of heat is their porosity to air, and the retention of the air in their pores.

Furnaces are largely used for heating. A pipe conveys the air from the outside of the building to the furnace; it is there heated and carried by distributing flues to the various rooms. From leakage or bad joints, carbonic oxide and sulphur gases often escape, and mingling with the heated air, are conveyed to the rooms. Care should be taken that the air brought to the furnace be not mixed with the stale air of the cellar. The opening of the air flue should be where there are no sources of contamination.

Great care should be taken in the construction of the furnace, and in its management; the water basin needs to be frequently replenished, to prevent the disagreeable dryness of the hot air. A system of heating from a central station, by steam or hot water, has recently been introduced in some cities. One of the central stations of such a system in New York has 64 boilers; from these the steam is discharged into vertical pipes or separators; it then passes into the street mains, which are from 10 to 24 in. in diam., and covered with mineral wool to prevent loss of heat; by the side of these is laid a return pipe, which carries the condensed water back to the boilers. Metres are employed, controlling and measuring the amount of steam used. Buildings along the line of the mains are furnished with steam for manufacturing or heating purposes. The system, though so recent as to be still in the stage of experiment, seems growing in public favor. See SANITARY SCIENCE.

WARMINSTER, a small ancient t. of Wiltshire, on the w. border of Salisbury plain, and 19 m. n.w. of Salisbury. The parish church dates from the reign of Henry III.; and the interesting edifices in the town and neighborhood are numerous. An important corn-market is held every week. Pop. '71, 5786; '81, 5460. '91, 5562.

WARNER, CHARLES DUDLEY, American author, was born at Plainfield, Hampshire co., Mass., Sept. 12, 1829; graduated at Hamilton College in 1851, and after spending a short time in surveying on the Missouri frontier, returned to the East in 1854, studied law in New York, and was admitted to the bar in Philadelphia in 1856. He practised in Chicago until 1860, when he removed to Hartford, Conn., to become assistant editor and afterwards editor-in-chief of the *Hartford Press*. In 1867 he became assistant editor of the *Hartford Courant*, with which he is still connected. In 1886 he took charge of that department of Harper's Magazine called the "Editor's Drawer." He has several times visited Europe and the East as correspondent for American newspapers, and has traveled extensively through the United States, contributing papers descriptive of social life and scenery to *Harper's Magazine*. He received the degree of A.M. from Yale in 1882, and from Dartmouth in 1884. He edited the *American Men of Letters* series, and has published *My Summer in a Garden* (1871) and *Back-Log Studies* (1872); *Saunterings* (1872); *Baddeck and That Sort of Thing* (1874); *In the Levant* (1876); *Mummies and Moslems* (1876); *Being a Boy* (1877); *A Roundabout Journey* (1883); *Their Pilgrimage* (1886); *On Horseback* (1888); *Studies in the South and West* (1889); *Our Italy* (1891); also the biographies, *Captain John Smith* (1881) and *Washington Irving* (1881); *A Little Journey in the World* (1890); and, in collaboration with Mark Twain, the novel, *The Gilded Age* (1873). In 1896–7 he edited the *Library of the World's Best Literature*.

WARNER, OLIN LEVI, b. Suffield, Ct., 1844. He studied sculpture in Paris at l'École des Beaux-Arts under Jouffroy, and in the studio of Carpeaux. Among his works are a bust of Rutherford B. Hayes, a medallion of Edwin Forrest, the statuettes "May" and "Night," and the heroic statues of Gov. Buckingham, Wm. L. Garrison, and Gen. Devens. At the time of his death (1896) he was engaged upon reliefs for the doors of the congressional library at Washington.

WARNER, SETH, 1743–84; b. Conn.; a leader of the "Green Mountain boys" in the disputes between New York and Vermont, where he had settled in 1765. At the capture of Ticonderoga and Crown Point in 1775 by Ethan Allen, he was second in command. As col. of Vermont forces, he participated in Montgomery's expedition to Canada; and he was commander at the action at Hubbardton in 1777. He was also at the battle of Bennington, and remained in the service till 1782, when ill health forced him to retire.

WARNER, SUSAN, b. New York, 1819; daughter of Henry W., lawyer, of New York. She was the author of *The Wide, Wide World*, published 1850, under the *nom de plume* of Elizabeth Wetherell, immensely popular in this country and in Europe, translated into French, German, and Spanish, in the first 10 years the sale numbering 500,000 copies. *Queechy*, 2 vols. (1852), was almost as well received. She wrote also *The Law and the Testimony* (1853), a compilation of scriptural texts proving the doctrines of Christianity; *The Old Helmet* (1863); and other works, secular and religious, including *Books of Blessing*, and *Wych Hazel* (1876). Her sister, Anna Warner, writing over the signature of Amy Lothrop, has published a number of popular books, among them *The Fourth Watch* (1872); and *The Other Shore* (1873). Susan W. d. 1885.

WARPING, a mode of improving land, practiced where rivers bring down large quantities of mud, or where mud is brought up from estuaries by the tide. It is practiced in some of the valleys of the Alps; and the rich soil brought down from the mountains is thus arrested, and made to increase the fertility of fields. It is practiced also in England, on the tidal waters of the Ouse, Trent, and other rivers falling into the Humber. There are not many places in Britain where the process of warping is capable of profitable application.

WARRANTY, in law, is an assurance of a fact, coupled with an agreement to make the assurance good, or render just compensation if it prove not to be good. In a common law sale of chattels, if the vendor expressly warrant the title, he is, of course, bound by the terms of his agreement; but, even when no such stipulation is entered into, if the vendor have the article in his possession and sell it as his own, he is bound by an implied warranty that the vendee shall obtain a good title and have peaceable

possession, and that there are no liens or incumbrances against it except such as are specially designated when the sale is made. If a seller of goods expressly warrant their quality, the stipulation thus made survives the receipt and acceptance of them by the vendee; and, if it be broken, it gives to the latter a right to sue for damages or defend on the ground of breach of warranty when sued for the purchase price. The ordinary measure of his damages, in either case, is the difference between the actual value of the articles and what they would have been worth if they had come up to the warranty. Where no special agreement is made as to the quality of personal property sold, the civil law rule is *caveat venditor*—let the seller beware—or that a sound price carries with it the seller's implied warranty of sound quality. But the ordinary common law rule of both England and America, in such cases, is *caveat emptor*—let the buyer beware—or that there is no implied warranty of quality. Exceptions to this rule arise, however, in instances in which the buyer has been unable to examine the goods before making the contract, and where he has not been able to exercise his own judgment as to their quality. Hence, when articles, which the vendee cannot examine, such as goods at sea, are contracted to be sold under a special description, the vendor impliedly warrants that they shall be merchantable under that description; when a manufacturer undertakes to manufacture an article ordered for a certain work or purpose, he impliedly warrants that it shall be reasonably fit for the accomplishment of that purpose; a victualer or dealer in provisions, who sells them for domestic consumption, impliedly warrants that they are wholesome, and when goods are sold by sample, the purchaser not inspecting the bulk, there is an implied warranty that they are like the sample, that they are merchantable under the description given, and that the buyer shall have a reasonable opportunity to inspect them before he shall be bound to complete the purchase. But when food stuffs are sold as merchandise, to be resold by the vendee, there is no implied warranty that they are wholesome. And, if one specifically describe an article to be manufactured for him, and it be made according to his description, the manufacturer does impliedly undertake that it shall be suitable for any undisclosed purpose, to which the buyer may have intended it should be applied. In real estate law, the word warranty now usually denotes a covenant in a deed or conveyance, to the effect that the vendor will defend the title in the vendee against paramount claimants, and any acts of himself or those who may claim under himself; and that, if he fail to do so, he will be liable in damages to an amount not exceeding the purchase price of the property. In the law of insurance, a warranty is distinguished from a representation, in that the former is a statement or promise relating to the risk, which is inserted in the policy and must be strictly true or complied with or the contract will be void, while the latter is a mere collateral inducement outside of the contract, and needs to be only substantially complied with or performed.

WARREN is a place kept for the purpose of breeding game or rabbits.

WARREN, a co. in n.e. Georgia, drained by the Ogeechee and other rivers; 264 sq.m.; pop. '90, 10,957. Co. seat, Warrenton.

WARREN, a co. in n.w. Illinois, drained by Henderson river and Swan creek; 540 sq.m.; pop. '90, 21,281, chiefly of American birth, with colored. Co. seat, Monmouth.

WARREN, a co. in w. Indiana, bounded on the s.e. by the Wabash river; 360 sq.m.; pop. '90, 10,955. Co. seat, Williamsport.

WARREN, a co. in s. Iowa, drained by affluents of the Des Moines; 576 sq.m.; pop. '90, 18,269. Co. seat, Indianola.

WARREN, a co. in s. Kentucky, bounded on the n. by Green river; 530 sq.m.; pop. '90, 30,158. Co. seat, Bowling Green.

WARREN, a co. in w. Mississippi, having the Mississippi river for its w. boundary; 590 sq.m.; pop. '90, 33,164, chiefly of American birth, inclu. colored. Co. seat, Vicksburg.

WARREN, a co. in e. Missouri, having the Missouri river for its s.w. boundary; 435 sq.m.; pop. '90, 9913. Co. seat, Warrenton.

WARREN, a co. in n.w. New Jersey, having the Delaware river for its w. and n.w. boundary; 360 sq.m.; pop. '90, 36,553, chiefly of American birth, with colored. It contains Blue mountain and Jenny Jump mountain, crossing it from n.e. to s.w.; and Delaware water gap in the n.w. Co. seat, Belvidere.

WARREN, a co. in e. New York, having lake George for its e. boundary; drained by the Hudson and Schroon rivers; 940 sq m.; pop. '90, 27,866, chiefly of American birth, with colored. Among its mineral products is black marble, found at Glens Falls. Co. seat, Lake George.

WARREN, a co. in n. North Carolina, drained by the Roanoke and other rivers; 454 sq.m., pop. '90, 19,360, chiefly of American birth, inclu. colored. Co. seat, Warrenton.

WARREN, a co. in s.w. Ohio, drained by the Great Miami and the Little Miami rivers; 428 sq.m.; pop. '90, 25,468. Co. seat, Lebanon.

WARREN, a co. in n.w. Pennsylvania, drained by the Allegheny and other rivers; containing valuable petroleum wells; 855 sq.m.; pop. '90, 37,585, chiefly of American birth, with colored. Co. seat, Warren.

WARREN, a co. in central Tennessee, bounded on the e. by the Caney forth of the Cumberland and Rock river; 446 sq. m.; pop. '90, 14,413, chiefly of American birth, with colored. Co. seat, McMinnville.

WARREN, a co. in n. Virginia, having the Blue Ridge mountains on the s.e. boundary; forms a part of the Great Valley of Virginia; 234 sq. m.; pop. '90, 8280, chiefly of American birth, with colored. Co. seat, Front Royal.

WARREN, city and co. seat of Trumbull co., O.; on the Mahoning river and the Erie, the Pennsylvania Co.'s, and the Pittsburg and Western railroads; 55 miles s.e. of Cleveland. It has union graded schools, musical institute, gas and electric lights, electric street railroad, waterworks on the standpipe system, national and state banks, and daily and weekly newspapers; there are rolling, flour, paint, saw, and planing mills, linseed oil, tube, sprinkler, evaporator, and boiler works, and electric lamp, steel bath tub, and other factories. Pop. '90, 5973.

WARREN, a town in Bristol co., R. I., on Narragansett bay and the New York, New Haven, and Hartford railroad; 10 miles s.e. of Providence. It was incorporated in 1747; formerly included territory in Massachusetts; and has a town hall, the Hall public library, electric lights, national and state banks, weekly newspaper, iron foundry, and manufactories of cotton goods, braid, and twine. Pop. '90, 4489.

WARREN, Fitz Henry, 1816–78; b. and d. Brimfield, Mass. He emigrated to Burlington, Iowa, 1844, where he entered journalism and interested himself in politics; was appointed asst. postmaster-gen.; was a state senator, 1866, and minister to Guatemala, 1867–8. He fought in the union army during the civil war, and was breveted major-gen. He edited for a time the *Burlington Hawkeye*, and was connected with the *New York Tribune*, and *Sun*.

WARREN, Gouverneur Kemble, b. N. Y., 1830; graduated at West Point, 1850, and was commissioned in the engineers. He was employed in topographical work in the Mississippi valley, in the Pacific railroad explorations, and in Dakota and Nebraska; from 1859 to 1861 was assistant prof. of mathematics at West Point, and then became lieut.col. of a New York zouave regiment. He had commands at Big Bethel in the peninsular campaign and at the battles of Manassas, Antietam, Fredericksburg, Chancellorsville, and Gettysburg; was Hooker's chief topographical engineer, and chief engineer of the army of the Potomac. At Five Forks he led the combined 1st and 5th corps, and in the last year of the war had charge of Petersburg, and later, the Mississippi department. He left the volunteer service with rank of brevet maj.gen. and maj. of engineers in the U. S. army. He has since had charge of the construction of many fortifications, bridges, and harbor and river improvements. He d. 1882.

WARREN, Henry, president of the institute of painters in water-colors, was b. in London, Sept. 24, 1798. Warren's father inherited considerable wealth, which, however, he contrived to dissipate, and his children were left to shift for themselves. The subject of this memoir at first got a situation in a counting-house; but afterwards, having an intense love for art, was placed in the studio of Nollekens, the celebrated sculptor of the day. At Nollekens's, he was associated with Bonomi and Gibson. Through Benjamin West, Warren obtained an introduction to the sculpture-room of the British museum, where he practiced both drawing and modeling, and where he used to meet Haydon's pupils, Bewick, Christmas, and the Landseers. In 1818 he became a student of the royal academy, where he attended regularly for many years in the company of Etty, the Landseers, F. R. Lee, Webster, and others less distinguished. Warren's first paintings were in oil. He exhibited several of these from time to time at the academy. One was a subject from Collins's *Ode to the Passions*. Etty thought very highly of this picture, and Warren repeated it in water-color, and sent it for exhibition to the "New Society of Painters in Water-colors," of which he became a member at its foundation in 1835. Of this society, now known as the "Institute of Painters in Water-colors," Warren was president for over thirty years. The first great picture in water-colors exhibited by Warren was "The Happy Valley," from *Rasselas*—a piece embodying both landscape and figures, and displaying great power both in its composition and coloring. A great many of his subsequent pictures are on eastern subjects, leading some persons to suppose erroneously that he had lived a long time in Egypt, the Holy Land, Arabia, etc. Warren died in 1879.

WARREN, Henry W., D.D., b. Mass., 1831; graduated at Wesleyan university, Middletown, Conn., 1853, and joined the New England conference; for two years prof. ancient languages in Wilbraham academy; 1871–7, pastor Arch St. M. E. church, Phila., and St. John's, Brooklyn; in 1877, transferred to the Phila. conference and to Arch st. church; then to Spring Garden church in the same city; elected bishop, May, 1881; resides at Denver, Col.; is a counselor of the Chautauqua literary and scientific circle; has published *Sights and Insights*, a book of travels; *Recreations in Astronomy;* the Chautauqua primers on astronomy, and contributes to the denominational periodicals.

WARREN, James, 1726–1808; b. Mass.; graduated at Harvard in 1745. He was a merchant, who succeeded to a handsome estate on the death of his father in 1757. He also succeeded his father as high-sheriff of Plymouth county. He was elected to the legislature in 1766, and warmly advocated the rights of the colonists. He became president of the provincial congress on the death of Gen. Joseph Warren, and was for a time paymaster-gen. of the continental army. He was afterward speaker of the Massachusetts house of representatives.

WARREN, JOHN, 1753–1815; b. Mass.; graduated at Harvard, 1771; studied medicine, and settled at Salem, Mass. He took part in the battle of Lexington, and in June became a hospital-surgeon, afterward going to the front. He was also with Gen. Greene in 1778, and in the forces sent against Shay in 1786. He was one of the founders of the Harvard medical school, in which he was professor of anatomy. He delivered, in 1783, the first of the Boston 4th of July orations.

WARREN, JOHN COLLINS, 1778–1856; b. Boston; graduated at Harvard in 1797. He studied medicine with his father (Dr. John), and in London and Paris. He began practice in Boston in 1802, and soon rose to eminence. He was assistant-professor of anatomy and surgery at Harvard university, 1806–15; full professor, 1815–47; and professor emeritus, 1847–56. He was one of the founders and long an editor of the *Boston Medical and Surgical Journal*. He was also one of the founders of the McLean asylum for the insane, and of the Massachusetts general hospital, of which he was long chief-surgeon. In 1846 he used ether in surgery for the first time. He made a fine collection of specimens in anatomy and paleontology, now known as the Warren museum. Among his works are *Diseases of the Heart* (1809); *Comparative View of the Sensorial System* (1820); *Etherization* (1848); and *Mastodon Giganteus* (1855).

WARREN, JOSIAH (b. 1799, d. in Boston, Mass., April, 1874); was the author of a book entitled *True Civilization*, the central doctrine of which is that labor ought to be paid for by labor, an hour of a carpenter's work, for instance, by an hour of a doctor's. He put his theory into practice by establishing a "time store" in Cincinnati. Here labor values were exchanged for two years with some degree of success. In his young manhood he was a member of Robert Dale Owen's community at New Harmony, Indiana. It was the failure of this communistic scheme that led him to adopt a system which recognized the individual.

WARREN, JOSEPH, 1741–75; b. Roxbury, Mass.; graduated at Harvard in 1759, and became a physician in Boston in 1762. He took the place of Samuel Adams as orator at the 2d anniversary of the Boston massacre, and delivered an excellent address. In 1772 he was a member of the committee of correspondence. He was a member of the Suffolk county convention, which was called to oppose gov. Gage's proposed fortification of the s. entrance to Boston harbor, and as chairman of the committee appointed to remonstrate with Gage on that subject, drew up two papers, which were afterward laid before congress. In 1774 he was a member and president of the Massachusetts congress, and chairman of the committee of public safety. In March of the next year he was again the orator at the anniversary of the massacre. He had much to do with the success at Lexington, and in June, 1775, was commissioned maj.gen. He opposed the occupation of Charlestown Heights, advocated by Putnam and Prescott, thinking the American supply of ammunition too small to repel an attack. Overruled by a majority of the council, which resolved to fortify Bunker Hill, he went there as a volunteer, refusing to take the chief command offered to him by both Prescott and Putnam. As he was leaving the field among the last, he was killed by a ball in the forehead.

WARREN, MERCY (OTIS), 1728–1814; b. Mass.; sister of James Otis; wife of Gen. James Warren. She was active in the revolutionary movement, and carried on a correspondence with the chief public men of her time. She wrote *The Adulator*, a tragedy (1773); *The Group* (1775), both satirizing the royalists; *Poems, Dramatic and Miscellaneous* (1790); and a valuable *History of the Rise, Progress, and Termination of the American Revolution* (1805).

WARREN, MINTON, was born in Providence, R. I., in 1850, graduated from Tufts College in 1870, studied at Yale College, 1871–2, and at Leipzig, Bonn, and Strassburg, taking his degree of Ph.D. in 1879. The same year he was appointed associate in Johns Hopkins university, and in 1892 was made professor of Latin, which position he still holds. His principal writings are: *On the Enclitic Ne in Early Latin* (Am. Journ. Phil., vol. 2, 1881); *On Latin Glossaries with Especial Reference to the Codex Sangallensis*, 912 (Trans. Am. Phil. Assoc., vol. 15, 1885); *On the Contribution of Latin Inscriptions to the Study of the Latin Language and Literature* (ib. 1895).

WARREN, SAMUEL, D.C.L., 1807–77; b. Racre, Denbighshire, Wales, son of Samuel, LL.D.; studied medicine at Edinburgh, taking the prize on comparative jurisprudence. In 1828 he began the study of law at the Inner temple, London; practiced as a special pleader, 1831–37; in the latter year was called to the bar. He was conservative in politics, a strong supporter of lord Derby, and published *Ten Thousand a Year* in *Blackwood's*, 1839, in the interest of that party. Other publications are *Now and Then*, a novel (1847); *The Lily and the Bee* (1851), a poem, on the opening of the Crystal palace. In the same year he became queen's counsel; recorder of Hull, 1854–74; member of parliament from Midhurst, 1856; re-elected, 1857; resigned, 1859, having been appointed master in lunacy by lord Chelmsford.

WARREN, WILLIAM, b. Philadelphia, 1812, made his first appearance on the stage at the Arch Street (Philadelphia) theater, as "Young Norval," in which his father had made his *début*. In 1847 he became a member of the company at the Boston museum, with

which he long retained connection. Though little known outside New England, W. was one of the best comedians on the American stage. He d. 1888.

WARREN, William Fairfield, d.d., b. Mass., 1833; graduated Wesleyan university, Middletown, Conn., 1853; ordained and joined the New England Methodist conference, 1855; studied at Andover theological seminary, Berlin, and Halle; traveled in the east; elected professor of theology in the Boston Methodist theological seminary, 1861; president of the Boston university, 1873. He has published works on logic and systematic theology and *The Quest of the Perfect Religion* (1887). As a scholar he holds high rank.

WARRENSBURG, city and co. seat of Johnson co., Mo.; on the Black river and the Missouri Pacific railroad; 65 miles s.e. of Kansas City. It is the seat of the State normal school of the second district; contains electric light and street railroad plants, waterworks, about a dozen churches, and several banks; and has valuable sandstone quarries and mineral springs, grain elevator, flour and woolen mills, foundry and machine shop, and daily, weekly, and monthly periodicals. Pop. '90, 4706.

WARRICK, a co. in s.w. Indiana, bounded on the s. by the Ohio river; 390 sq.m.; pop. '90, 21,161. Co. seat, Boonville.

WARRINGTON, Lewis, 1782–1851; b. Va.; graduated William and Mary college, 1798; midshipman in the navy, 1800; was lieut. on the *Chesapeake* in her encounter with the British frigate *Leopard*, 1807; as master of the sloop *Peacock*, captured the British sloop-of-war *Épervier*, off cape Canaveral, Fla., 1814; received for this a gold medal from congress; took 14 British merchantmen, mostly in the bay of Biscay, 1814; became capt.; went to India; captured the English cruiser *Nautilus* in the straits of Sunda, 1815; commanded a squadron in the West Indies; was a member of the navy commission board, 1827–30; chief of ordnance and hydrography, 1847, till his death.

WARSAW, village and co. seat of Wyoming co., N. Y.; on the Buffalo, Rochester, and Pittsburg, and the New York, Lake Erie, and Western railroads; 47 miles s.e. of Buffalo. It contains a union school, gas and electric light plants, national and private banks, and a school library; and has several extensive salt works, iron foundry, a sanitarium, several factories, and weekly newspapers. Pop. '90, 3120.

WARSAW, a government of Russian Poland, adjoining Prussia, watered by the Vistula, Bzura, and Pilica rivers; about 5623 sq.m.; pop. '94, 1,499,264. The surface is level, and generally fertile. Capital, Warsaw.

WARSAW, formerly the capital of Poland (q.v.), now capital of the Russian, or rather Russianized, government of Warsaw, stands on the left bank of the Vistula, about 95 m. e. of Berlin by railway. Lat. of observatory, 52° 13′ n., long. 21° 2′ east. It stands partly on a plain, partly on rising ground sloping upward from the left bank of the river, extends over a wide area, and consists of the city proper, and a number of suburbs, several of which are beautifully built. Two iron bridges connect Warsaw with the suburb of Praga, on the right bank of the Vistula. The streets are mostly narrow, though in several instances they are broad and handsome. The Vistula at Warsaw is broad, shallow, and ever-changing in its sandy course, and is navigable for large vessels only when, after thaw, rivers of melted snow pour down into it from the Carpathians, or when it is swelled by the autumn rains. Seen from Praga, on the right bank, the castle, standing on a steep ascent, has a most imposing effect. Attached to the Saxon palace are a spacious court and gardens, which are considered the finest promenade in the city. Among the other buildings there are many palaces; the cathedral of St. John (dating from 1250), a Gothic building of great beauty, containing statuettes and many interesting monuments, among which is one by Thorwaldsen; the Lutheran church, the loftiest building in Warsaw, and numerous other places of worship, including synagogues. There are several large and memorable squares, as the Sigismund square, containing the monument, erected by Ladislas IV., in honor of his father, Sigismund III. In this square, on April 8, 1861, 40 unarmed and unresisting Poles were massacred. The citadel, erected by the emperor Nicholas, for the express purpose of intimidating, and, if necessary, destroying the city, commands, from its situation, every part of Warsaw. The university, broken up by the emperor Nicholas after the insurrection of 1830, was re-established by decree, 1869, and is attended by about 1000 students; and besides this institution, there are several minor colleges, fine museums, gymnasia, etc. Woolen and linen fabrics, chemicals, sugar, and leather, and a vast number of other articles are manufactured. Pop. '97, 614,752.

WARTBURG, War of the, the name given both to a grave poetic contest, which is represented to have taken place on the Wartburg, and also to a poem in the Middle High-German dialect, which commemorates the event. At the time when the aforesaid dialect had attained its highest literary development, and its poets enjoyed a brilliant reputation, Hermann, the munificent Landgraf of Thuringia, had made his court a sort of refuge or home for the *irritable race*, as well as for many other people. It could hardly fail, under the circumstances, that quarrels and jealousies should abound; and, in fact, allusions to these are sufficiently distinct in several of the most distinguished writers who lived at the Thuringian court—e. g., in Wolfram von Eschenbach and Walther von der Vogelweide. But soon after the conception of these things underwent a sort of

mythical transformation, and the occasional temporary and natural rivalries of the poets were changed into a particular and premeditated contest for superiority in poetic skill; and to the list of those poets who actually had intercourse with each other at Eisenach were now added others partly historical, and in part purely fictitious characters—e.g., the virtuous Schreiber, Bitterolf, Reinmar (subsequently confounded with Reinmar von Zweter), the almost mythical Heinrich von Ofterdingen, and the wholly mythical Master Klingsor, the Transylvanian magician and astrologer. On the basis of this historico-mythical tradition, and under the formal influences of the then much admired songs of emulation, riddle-contests, and ecclesiastical plays, there was composed, about the year 1300, a strange, obscure, unharmonious poem in two parts, called *Kriec von Wartburg*. In the first of these, executed in a long and artistically managed measure, and entitled *Tone des Fürsten von Thuringia*, Heinrich von Ofterdingen challenges the other poets to a contest in verse—the fate of the vanquished to be death—and asserts the excellence of Leopold, duke of Austria, over all the other princes. Victory, however, inclining to the Eisenachers, Heinrich calls in Klingsor to his aid, who, on his part, fights his verse-battle against Wolfram by the assistance of evil spirits, with riddles and dark science. With distinct reference to Klingsor's "black art," the simpler and shorter measure of this second part is called *Schwarze Ton*. Throughout the whole poem, which may be regarded as the first attempt at a secular drama, but which is rather an intermediate link between the lyric contest and the drama, one may trace an unmistakable imitation of Wolfram's style of poetry. The author is unknown. From the inequality of the style one is disposed to conclude that several hands were employed in its composition. The poem, which has been much overrated in modern times, does not seem to have exercised any particular influence on literature. In a prose form the story of the Wartburg contest first appears—in the Thuringian chronicles—after the beginning of the 14th c., and probably owes its origin to the poem. The poem was printed in a separate edition by Ettmüller (Ilmenau, 1830), and is also to be found in Bodmer's and Von der Hagen's collection of the *Minnesinger*.—See Von Plotz, *Ueber den Sängerkrieg auf Wartburg* (Weimar, 1851).

WART-HOG, *Phacochœrus*, a genus of *suidæ*, closely resembling the true hogs in most of their characters, and particularly in their feet, but remarkably differing from them in their dentition; the molar teeth being much like those of the elephant, and replacing one another in the same manner. There are two triangular incisors in the upper jaw, and six small ones in the under; the tusks are lateral, very large, project far from the mouth, and are bent upward; there are six or eight molars in each jaw. The head is very large, and the muzzle very broad; the cheeks furnished with large wart-like excrescences, so that the appearance is altogether very remarkable and uncouth. The species are all natives of Africa. They feed very much on the roots of plants, which they dig up by means of their enormous tusks. The African Wart-hog, or Haruja (*P. Æliani*), a native of Abyssinia and of the central regions of Africa, from the coast of Guinea to that of Mozambique, is nearly 4 ft. long, with a naked slender tail of one foot, is scantily covered with long bristles of a light brown color, and has a mane sometimes 10 in. long, extending from between the ears along the neck and back. Another species is found in the s. of Africa (*P. Æthiopicus* or *pallasii*), the *valke vark* of the Dutch colonists at the cape of Good Hope. The incisors of the latter fall out at an early age, those of the former are persistent.—A closely allied genus is *potamochœrus*, of which there are several species, as the *bosch vark* of Cape Colony (*P. Africanus*), which is nearly black, with whitish cheeks having a central black spot; and the Painted Pig of West Africa (*P. penicillatus*), which is reddish, with black face, forehead, and ears. The species of *potamochœrus* frequent swampy grounds, and sometimes receive the name of Water-hog. They have longer ears than the true water-hogs, tapering and ending in a pencil of hairs; the face is elongated, and has a huge protuberance on each side. The flesh of all the wart-hog and water-hogs is in high esteem. They are hunted by dogs, which are often killed in the encounter with them. They are much addicted to fighting among themselves.

WARTON, Joseph, d.d., was born at Dunsfold, Surrey, in 1722. His earlier education he received from his father, the Rev. Thomas Warton, sometime professor of poetry at Oxford. At the age of 14 he was sent to the great school at Winchester, whence, in 1740, he was transferred to Oriel college, Oxford, where, four years afterward, he took his degree of b.a. After passing the intermediate years as a curate at Chelsea and elsewhere, in 1748 he was presented by the duke of Bolton to the rectory of Winsdale, near Basingstoke, a living of no great value, yet sufficient to determine his marriage with a Miss Damon, to whom he had been engaged. Previous to this he had become known as a writer of verse in the *Gentleman's Magazine*, Dodsley's *Museum*, etc., and as the author of a volume of *Odes and other Poems*. In 1751 he went abroad with the duke of Bolton; and after his return he issued, in 1753, an edition of Virgil, with a translation of the *Eclogues and Georgics*. This, with the critical notes and dissertations appended to the work, met with great approval, and subsequently procured him from the university of Oxford the degree of m.a. In 1756 appeared the first volume of his chief literary performance, the *Essay on the Writings and Genius of Pope*, the second and concluding volume of which was not given to the world till 1782. Venturing, as he did, to question the positive supremacy which it was then fashionable to attribute to Pope, Warton

did not by this work attain any very instant increase of popularity; but the value in relation to the literature of the time, of the critical principles announced in it, as also in his other more casual essays, has since been sufficiently recognized. In 1755 Warton was appointed second master of Winchester school, of which he became head in 1766. Soon after, he revisited Oxford, and had conferred on him the degrees of bachelor and doctor of divinity. Of preferment in the church, he had subsequently his full share. By the good offices of Dr. Lowth, bishop of London, he was made, in 1782, a prebendary of St. Paul's; and the living of Thorley, in Hertfordshire, was conferred on him. He obtained besides, in 1788, a prebend in Winchester cathedral, and the rectory of Easton, which he soon after exchanged for that of Upham. The mastership of Winchester he resigned in 1793, and devoted himself to the preparation of an annotated edition of Pope, which was completed in 9 vols. 8vo in 1797. At his death, Feb. 23, 1800, he was engaged on a similar edition of Dryden, of which he had published two volumes. Though Warton's reputation has not survived as a poet, yet it certainly has as a critic, along with that of his more distinguished brother.—See *Biographical Memoirs of Rev. Joseph Warton, D.D.*, by Rev. John Wooll, A.M. (1806).

WARTON, Thomas, the younger brother of the preceding, was born in 1728, at Basingstoke, in Hampshire, of which place his father had then become vicar. His earlier education he received chiefly at home from his father; and in 1743 he was entered at Trinity college, Oxford, where, in 1750, he took his degree of M.A. The year after, he obtained a fellowship. He remained at the university, employed as a tutor; and in 1757 he was made professor of poetry, in which capacity he was much esteemed as a lecturer. In 1767 he took his degree as bachelor of divinity, and was soon after presented to the living of Kiddington by the earl of Lichfield. In 1782 that of Hill Farrance, in Somersetshire, fell to him by favor of his college; and these two unimportant pieces of ecclesiastical preferment were the only ones he ever enjoyed. Very early he became known as a poet, and in 1754 he published a volume entitled, *Observations on the Fairie Queene of Spenser*, which established his reputation as one of the first critics of the day. In a second edition of the work, issued in 1762, it was expanded into two volumes. Of Warton's miscellaneous literary activity, no account need be given in detail. The work by which he is now chiefly remembered is his *History of English Poetry*, the first volume of which was published in 1774. Two other volumes followed in 1778 and 1781, but at his death the work remained unfinished. In its wealth of information regarding the earlier portion of our literature, the book remains to this day unrivaled. As a poet, also, Warton takes distinct, if not very high rank. In 1777 he published a collection of such of his scattered pieces as he deemed most worthy of being reprinted, and the acceptance it met with is shown in the successive editions of 1778, 1779, and 1789, as also in the fact, that on the death of Whitehead, the poet-laureate, Warton had the honor, such as it might be, of being selected to succeed him in the office. The last work on which he was engaged was an elaborately annotated edition of the minor poems of Milton. Of this, published in 1785, a carefully prepared re-impression was issued the year after his death, which took place suddenly on May 21, 1790. In 1802 a new edition of his poems was published, with a life of the author by Mr. Mant.

WARTS (sometimes known in surgery by their Latin name *verrucæ*) are collections of lengthened papillæ of the skin (q.v.), closely adherent and ensheathed by a thick covering of hard dry cuticle. From friction and exposure to the air, their surface presents a horny texture, and is rounded off into a small button-like shape. Such is the description of the simple wart, which is so commonly seen on the hands and fingers (and rarely on the face or elsewhere) of persons of all ages, but especially of children. Among other varieties of warts are: (1) One to which the term *verruca digitata* has been applied. It is more elongated in shape, and less protected by cuticle than the preceding. It is said to occur nowhere but on the scalp of women of adult age, and sometimes to occasion great annoyance in brushing and combing the hair. (2) *Subungual warts*, growing, as their specific name implies, beneath or at the side of the finger or toe-nails. They originate beneath the nail, and as they increase, they crop out either at the free extremity or the side of the nail, and are usually troublesome, and often very painful. They are generally of syphilitic origin. (3) *Venereal warts*, caused by the direct irritation of the discharges of gonorrhœa or syphilis, and occurring about the parts which are liable to be polluted with such discharges. They attain a larger size, and are more fleshy and vascular than other warts.

Nothing is known of the causes of warts further than the third variety is induced by an irritating discharge, that the malignant form of wart which is the beginning of chimney-sweepers' cancer is caused by the irritation of soot, and that persons engaged in dissection and *post-mortem* researches are especially liable to them; hence we may infer they are always due to some local irritation. Venereal warts are certainly contagious; with regard to others, we cannot speak positively. In some cases, but not invariably, blood from a wart is capable of producing similar warts when applied to the skin. In consequence of the capricious way in which warts often spontaneously disappear, there are numerous popular charms for their removal, several of which may be found recorded in the pages of *Notes and Queries*. Common warts are so apt to disappear, that

they may be often left to themselves. If it is desired to remove them, glacial acetic acid is perhaps the best remedy; it must be applied with a camel-hair pencil till the wart is pretty well sodden, care being taken not to blister the neighboring skin. One or at most two applications are usually sufficient. Nitrate of silver and tincture of iron are popular and general applications. Small warts hanging by a neck, may often be very simply removed by the moderately tight application of an elastic ligament (for example, a small broken elastic ring) to the base. The wart usually shrivels up, and falls off within a week. The other varieties of warts must be left to the surgeon.

WARWICK, a co. in s.e. Virginia, having the James river on the s.w.; 165 sq.m.; pop. '90, 6650, chiefly of American birth, with colored. Co. seat, Newport News.

WARWICK, a municipal and parliamentary borough, chief t. of the county of the same name, stands in the middle of the county, on the Avon, 21 m. s.e. of Birmingham. It is a very ancient town, and contains many ancient and interesting buildings and institutions. Of these the most notable is Warwick castle, the principal residence of the earls of Warwick, beautifully situated on a rocky elevation, 40 ft. high, on the banks of the Avon. Of this edifice, Guy's tower, 128 ft. high, was built in 1394; and Cæsar's tower, still more ancient, is 147 ft. high. The interior, before the castle was partly burned, Dec. 3, 1871, was remarkable for its splendor and elegance, and has been restored in similar style. There are numerous charities, with schools, libraries, etc. Agriculture and general trade afford employment to a large number of the inhabitants. Warwick returns one member to the house of commons. Pop. '91, of municipal borough, 11,905; of parliamentary borough, 39,102.

WARWICK, a town in Lancaster co., Pa., adjoining the borough of Lititz (q.v.). Pop. '90, 3153.

WARWICK, a town in Kent co., R. I.; on the Providence and Pawtucket rivers, Narragansett and Greenwich bays, and the New York, New Haven and Hartford railroad; containing a large number of villages, principally engaged in the manufacture of cotton, woolen, and print goods. It was settled in 1642, named after the earl of Warwick, and called by the Indians, Shawomet. There are national and savings banks in the village of Centreville, and the town is well supplied with churches, public schools, libraries, electric lights, and electric railroads. Drum Rock, a balanced rock of great size, can be moved by a child, and makes a sound which can be heard for miles. Pop. '90, 17,761.

WARWICK, Guy, Earl of, a hero of early English legend. He is said to have lived in Saxon times, during the reign of Athelstan in the 10th century. There is no reason to believe that he ever lived at all. The legend of Guy is of Anglo-Norman origin, but does not go back, so far as known, beyond 1300. Chaucer alludes to sir Guy in the *Canterbury Tales*, and Shakespeare in *Henry VIII.* (if that work be his), to sir Guy and Colbrand, a Danish giant, whom Guy fought.

WARWICK, Richard de **BEAUCHAMP**, 12th Earl of, 1381–1439; succeeded to the title in 1401. He participated in the war with Owen Glendower and the Percys, and was at the battle of Shrewsbury. In 1413 he went to France as a commissioner to treat for peace, and the next year attended the council of Constance. In 1415 he was capt. of Calais, and, 1418, ambassador to Burgundy. He was presently made earl of Aumerle. He was regent of France, 1425–28, and of France and Normandy, 1437–39.

WARWICK, Richard **NEVILLE**, Earl of, K.G., popularly named the king-maker, was eldest son of Richard, earl of Salisbury, and Alice, daughter and heiress of Thomas Montacute. He was born about 1420, shortly before the accession of Henry VI. Lord Richard Neville, as he was then styled, early manifested his distinguished bravery and brilliant personal qualities in a hostile incursion across the Scottish marches, in which he accompanied his father, the earl of Salisbury. He became the most powerful nobleman in the kingdom, by his marriage with Anne, daughter and heiress of Richard de Beauchamp, earl of Warwick. He not only acquired by this alliance the broad lands of the Warwick family, but was created earl of Warwick, with succession to the heirs of his wife. He is the most prominent figure in the civil war of the roses, one of the darkest periods of English history. The duke of York gained his support by his marriage with lady Cecille Neville; and when the barons declared the incapacity of Henry VI., and chose the duke to be protector of the kingdom, Warwick led into the field his well-tried borderers of Wales. The Yorkists and the Lancastrians first met at St. Albans in 1455, when Warwick, rushing suddenly into the town at the head of his men, mainly won the battle by his impetuous onset. He was rewarded with the government of Calais—"then," says Comines, "considered as the most advantageous appointment at the disposal of any Christian prince, and that which placed the most considerable force at the disposal of the governor." He also obtained command of the fleet for five years. In 1458 he sailed from Calais with five large and seven small vessels, and attacked a fleet of 28 ships, belonging to the free town of Lübeck. After a battle of 6 hours, he took 6 of the enemy's vessels. In 1460 he landed in Kent at the head of his troops, and entered London amid the acclamations of the people. He defeated the queen's army, near Northampton, with great slaughter, and obtained possession of the person of the king. Richard, duke of York, now advanced his claim to the throne. Queen Margaret raised an army to rescue the king; and the duke committed the idiotic monarch to the custody of the duke of Norfolk and Warwick, while he advanced to Wakefield to attack the Lancastrians. The duke was taken, and put to death; and Warwick's father, the earl of Salisbury, with twelve other Yorkist

chiefs, was beheaded at Pontefract. Another battle at St. Albans was won by the Lancastrians, but Edward, earl of March, now duke of York, accompanied by Warwick, marched boldly upon London, which was throughout Yorkist, and Edward was proclaimed king by the style of Edward IV. The next battle was that of Towton, near York. The Lancastrians had retaken the pass of Ferrybridge, on the river Aire, and Warwick, in despair at the loss of so good a position, rode up to Edward, and dismounting, shot his own horse through the head, as a signal for an attack from which there could be no retreat, exclaiming: "Sir! let him flee who will flee; but by this cross" (kissing the hilt of his sword) "I will stand by him who will stand by me!" The Lancastrians were defeated with immense loss; and Edward, returning to London in triumph, was crowned June 22, 1461. The battle of Hexham was followed by the capture of Henry; and Warwick, who had been left in command in London, placed the deposed king on a horse, under whose belly his feet were fastened, and thus led him through Cheapside to the tower. Warwick having been authorized to negotiate with Louis XI. of France for the marriage of his sister-in-law, the princess Bonne, of Savoy, to king Edward, could not brook the king's sudden marriage with Elizabeth Woodville, and seemed inclined to show that he could pull down as well as set up kings. He was now at the height of his power. To the earldoms of Warwick and Salisbury, with the estates of the Spencers, he added the offices of high-admiral and great-chamberlain, together with the lord-lieutenancy of Ireland and the government of Calais. Comines states the income of his offices at 80,000 crowns a year, besides the immense revenues accruing from his patrimony; yet he had the meanness to accept a secret pension and gratuities from Louis XI. After being sent into honorable banishment by means of embassies to France, Burgundy, and Brittany, he gave his daughter in marriage to George, duke of Clarence, without asking Edward's permission. He soon afterward broke out into revolt against Edward, and concluded a treaty with queen Margaret, by which it was agreed that her son, prince Edward, should espouse Anne Neville, Warwick's daughter, and that in failure of issue, the crown should devolve on Clarence. King Edward escaped to Holland, and Henry VI. resumed the sovereignty. Edward, however, raised a body of Flemings and Dutchmen, and, landing near Hull, advanced toward London. He gave battle to king Henry's army, commanded by Warwick, at Barnet, April 14, 1471. The battle was memorable and important. Warwick and his brother, Montague, were left dead on the field, and with them fell the greatness of the house of Neville. This fatal battle, followed by the decisive engagement of Tewkesbury, completed the defeat of the Lancastrians, and concluded the sanguinary war of the roses. It appears (Fenn's *Letters*) that every individual of two generations of the great families of Warwick and Somerset fell on the field or on the scaffold, a victim of these sanguinary contests. Warwick is the most conspicuous personage of these disturbed times. He kept open house wherever he resided, and daily fed at his various mansions 30,000. He loved turbulence for its own sake, and was ready to make or unmake any king, according to the caprice of the moment, and in order to show his power.

WARWICK, Robert **RICH**, Earl of, about 1590–1658; succeeded to the title, 1618, and was a descendant of lord-chancellor Rich. He joined himself to the Puritan movement, took great interest in the colonization of Rhode Island, and was a friend of Thomas Hooker, the founder of Hartford. In the parliamentary wars he was a supporter of the Puritan cause, in 1642 served under Northumberland as lieutenant of the fleet, and during the protectorship of Cromwell was chosen to bear the sword of state in the latter's presence.

WARWICKSHIRE, one of the midland counties of England, bounded on the w. by Worcestershire, on the n. by Stafford and Leicester shires, and on the s. mainly by that of Oxford. Area, 885 sq.m.; pop. '91, 805,070. The surface, though presenting no lofty hills, is marked by gentle eminences and vales. The n. districts of the county were formerly occupied by the forest of Arden, of which there are still remains; and the scenery, in general remarkably rich and charming, is varied by moor and heath. The principal rivers are the Avon, flowing from the n.e. to s.w., and the Tame in the north. The soil varies much in quality, being cold and heavy on the higher and more exposed positions; while in more favorable districts it is as a rule good. The chief manufacturing centers in Warwickshire are Birmingham and Coventry; the brass jewelry, iron, and steel-pen trades are carried on in the former, and ribbon-weaving and watchmaking in the latter. Of minerals, coal, chalk, lime, and marl are found. It contains four parliamentary boroughs, six municipal boroughs, and ten market towns. The county returns four members to the house of commons.

WASATCH, a co. in n.e. Utah, area, 3444 sq. m.; pop. '90, 3595, chiefly of American birth. In the n. portion are the Uinta mountains; the Wasatch mountains lie along the w. border, a long range extending from the n. border of Utah nearly to the Colorado river, the highest peaks of which are 11,500 ft. high, their sides broken by cañons varying in depth from 2000 to 5000 feet. The summits of this range rise from a plain varying from 4250 to 6000 ft. in height, and reach a further elevation of from 6000 to 7000 ft. above the valley. Silver is found. Co. seat, Heber.

WASCO, a co. in n. Oregon, having the Columbia river on the n. and on the w. the Cascade range of mountains, including Diamond Peak, and the Blue mountains on the s.e.; area, 3315 sq. m.; pop. '90, 9183. Co. seat, The Dalles.

WAS'ECA, a co. in s. Minnesota, 430 sq.m.; pop. '90, 13,313. Co. seat, Waseca.

WASH, a wide estuary on the e. coast of England, between the counties of Lincoln on the n.w. and Norfolk on the s.e., is about 22 m. in length, and 15 m. in average breadth. It is surrounded by low and marshy shores, and receives the rivers Witham, Welland, Ouse, Nen, and Nar. The estuary for the most part is occupied by sandbanks, dry at low water, and between these sandbanks are the channels through which the rivers mentioned flow into the North sea. On both sides of the channel by which the Ouse falls into the sea, considerable tracts of land have been reclaimed. Anchorage is afforded to vessels by two wide spaces or pools of water, called respectively Lynn deeps, opposite the coast of Norfolk, and Boston deeps, opposite the Lincolnshire coast.

WASHBURN, a co. in n. western Wis.; formed, 1883, from part of Burnett; 864 sq.m.; pop. '90, 2926. It is drained by branches of the St. Croix. Co. seat, Shell Lake.

WASHBURN, Cadwallader Colden, ll.d., b. Maine, 1818; brother of Elihu B. and Israel, jr. He removed to the west in 1839, and lived in Illinois and Wisconsin. He was elected to congress in 1856 and served three terms. He was a delegate to the peace conference of 1861, but soon after raised and became col. of a cavalry regiment, commanded an expedition into Mississippi, and later was at the head of divisions in the Vicksburg campaigns, held a command under Gen. Banks in Louisiana, and reached the rank of maj.gen. of volunteers. From 1867 to 1871 he was again a member of congress, and in the latter year was elected governor of Wisconsin by the republican party of that state. He was largely engaged in the manufacture of lumber and flour in Wisconsin and Minnesota. He d. 1882.

WASHBURN, Charles Ames, b. Maine, 1822; educated at Bowdoin college. He went to California in 1850, became editor and afterward proprietor of the *Alta California*. He was editor and proprietor of the San Francisco *Times*, 1858–61. He acted with the republican party from its foundation, was a presidential elector in 1860, and was minister to Paraguay, 1861–68. Violence was offered to his legation by Lopez, and Washburn saved them only by calling the aid of an American squadron. D. 1889.

WASHBURN, Edward Abiel, d.d., 1819–81; b. Boston; graduated, Harvard college, 1838; studied theology at Andover seminary, and at the divinity school of Yale college, graduating 1842; was licensed as a Congregational minister, but after preaching six months entered the Episcopal church, and was ordained by bishop Eastburn, 1844; was rector of St. Paul's, Newburyport, Mass., for seven years; spent six months in China, 1851, returning through India, Egypt, Palestine, and Europe, 1853; became rector of St. John's church, Hartford, and prof. of church polity at the divinity school, Middletown; rector of St. Mark's church, Philadelphia, 1862; of Calvary church, New York, 1865; visited Europe, 1871, as a delegate of the evangelical alliance. Dr. Washburn was a member of the committee on Bible revision, a translator of part of Lange's commentaries, a contributor to reviews and other periodicals, an eloquent speaker, and a broad churchman in his views, fraternizing cordially with ministers and Christians of other denominations. His intellectual power was great, and he was admired equally for a certain symmetry and nobleness of character.

WASHBURN, Emory, ll.d., 1800–77; b. Mass.; graduated at Williams college in 1817. He was admitted to the bar in 1821, and practiced his profession at Worcester, 1828–56, attaining a high rank. He was a justice of the court of common pleas, 1844–47, and governor of Massachusetts, 1854–55. He had previously served in both branches of the state legislature, and had declined a whig nomination for congress, though in a district surely whig. The overthrow of the whigs in Massachusetts by the "know-nothings" cut short his political career. He afterward acted with the republican party, and was in the Massachusetts legislature as chairman of the judiciary committee the last year of his life. He was prof. in the Harvard law school, 1856–76. His most important works are *Treatise on the American Law of Real Property* (1860–62) and *Law of Easements and Servitudes* (1863).

WASHBURN, Israel, 1784–1876; b. Mass.; in 1806 went to Maine, and two years later became a shipbuilder on the Kennebec river, near the site of Richmond. He afterwards settled in Livermore, Maine. He was the father of Samuel Benjamin, William Drew, Elihu Benjamin, Cadwallader Colden, Charles A., and Israel, jr.

WASHBURN, Israel, jr., ll.d., b. Maine, 1813; admitted to the bar, 1834. He continued to practice his profession with success till 1850, when he was elected to congress; and he was four times re-elected. He was governor of Maine, 1861–62, and in 1863 was appointed collector of Portland. He d. 1883.

WASHBURN, William Burritt, ll.d., b. Mass., 1820; graduated at Yale college, 1844. He became a manufacturer in Greenfield, Mass., and president of a bank. He was a member of the Massachusetts senate in 1850, and of the house in 1854. In 1862 he was unanimously elected to congress on the republican ticket, and was four

times re-elected. He was governor of Massachusetts, 1871–74, when he resigned, having been elected to fill the remainder of Charles Sumner's term in the U.S. senate. His term expired in 1875. He was a trustee of Yale and Smith colleges. He d. 1887.

WASHBURNE, Elihu Benjamin, b. Livermore, Me., 1816; as a boy was apprenticed in the Kennebec *Journal* office; studied law at the Harvard law school; was admitted to the bar, and in 1842 began practice at Galena, Ill., where he became acquainted with Gen. Grant. He was sent to congress as a whig in 1853, and held his seat until 1869, joining the republican party not long after its organization. In 1869 he was appointed secretary of state by President Grant, but resigned on account of ill-health, and was appointed minister to France, a position which he held until 1877, when he was recalled at his own request. In the Franco-Prussian war he was requested by the German government to act as its representative in France. He remained in Paris during the siege and the rule of the commune, and his energetic and impartial aid to foreign citizens and to suffering Parisians was recognized by the governments of France and Germany as well as by that of the United States. He d. 1887.

WASHING, DOMESTIC. Although domestic washing is with housekeepers a simple enough process, yet it may be useful to give a brief description of the most efficient way of conducting it, in so far as experience and correct principles can guide such an operation. The first essential is suitable water, in other words, *soft* water. See Water-supply. Yellow soap (q.v.) being the kind chiefly used in washing linen, it is well to bear in mind that it is not desirable to purchase it very pale in color, or very low in price. In order to gratify the desire for a light color soap-makers are obliged to reduce the strength of good dark soaps with adulterants; and it will give some idea of how easily the demand for cheapness may be met to state that hard soap which should not contain so much as 25 per cent of water, can be made with as much as 75 per cent. Soap, as is well known, improves by keeping. Soft or potash soap is sometimes used to wash coarse things, on account of its being stronger than hard soap, but its smell is objectionable. Soda is easily procured good; and with respect to washing-powders, as their merit depends on the amount of alkali which they contain, suffice it to say that to buy them is only a dear way of buying soda.

In arranging clothes for washing, it is desirable to sort them into kinds most suitable for washing together; such as lace, nets, and fine muslin into one heap; white body-linen into another; colored things of the nature of prints and ginghams into another; and so on. It is also desirable to wash clothes as soon as possible after they are soiled. Previous to washing, all white articles should be soaked for a night in cold water, in which a little soda has been dissolved, as the steeping in alkaline water greatly aids in removing all dirt of a greasy nature. The clothes should then be washed twice in clean tepid water with a sufficient supply of soap. If the water is quite cold, the dirt is taken off with difficulty; and if too hot, it is apt to fix it into the fiber of the cloth. The clothes should next be examined for spots or stains, so as to remove them, if possible, by an additional rubbing; after which they are boiled for at least 15 minutes in soap and water. Ink-stains or iron-molds require to be taken out with oxalic acid, or the essential salts of lemon (oxalate of potash); and fruit-stains by boiling the stained part with pearl-ash. After being boiled, the clothes are rinsed twice in cold water; and in the second rinsing, a little stone blue is added, to neutralize any yellowness occasioned by the washing. When this is done, they are wrung, and hung out to dry.

For the washing of flannels, it is even more desirable that the water should be softer than for linen or cotton; and it should contain no soda or potash in any form, as although a little alkali would more effectually remove dirt, yet it always turns woolens yellow, and at the same time thickens them. It is well to remember also that all rubbing, wringing, or squeezing tends to make woolen goods shrink, by facilitating their tendency to felt or mat into a thicker fabric. With respect to ladies' colored dresses made of fine wool, such as merino, it is considered best to wash them in warm soft water with ox-gall, say a pint in a tubful of water. Ox-gall is a soap in its chemical nature, and it clears and brightens the colors.

White silk articles, as stockings and gloves, should be washed with soap, first in milk warm, and afterward in nearly boiling water. They will be improved if hung up for a short time in the fumes of burning sulphur (sulphurous acid) while still damp.

WASHING OF FEET (called in Latin *pedilavium*, and sometimes *mandatum*, from the first word of the "little chapter" in the service), one of the ceremonial observances of the holy week (q.v.) in the Roman Catholic Church. It forms part of the service of holy Thursday, which day, from the word *mandatum*, is also called Maundy Thursday. The origin of this observance is extremely ancient. It is founded on the example and exhortation of our Lord in John xiii. 5–14; and is traceable in the writings of Justin, Tertullian, Ambrose, and Augustine, as well as in many of the early councils. In some churches, however, or at least at some particular periods, the day fixed for the ceremonial was good Friday, although for many centuries it has uniformly been assigned to holy Thursday. It is necessary, however, to distinguish from the ceremonial of the holy week, another washing of the feet (also called *pedilavium*), which, in the case of catechumens, preceded baptism, and which, in many churches, was accompanied by a washing of the head,

captilavium, and took place on palm Sunday (q.v.), thence called "Dominica Capillavii." To this usage Sts. Ambrose and Augustine distinctly refer. In the mediæval and modern church, the washing of feet has generally followed the solemn mass of the day. In those churches where the ceremony is still retained, the officiating bishop or priest, wearing a cope and girt with a towel, and attended by a deacon and subdeacon, washes, dries, and kisses the right foot of a certain number of pilgrims, generally twelve, in memory of the twelve apostles; after which all the pilgrims are hospitably entertained, and served in person by the bishop, who distributes to each a dole in money or provisions. An appropriate service, consisting of a gospel (John xiii. 1–14) sung by the deacon, a chapter ("Mandatum novum") chanted by the choir, and a prayer by the bishop, accompanies the ceremonial. The washing of the pilgrims' feet on holy Thursday forms a very striking part in the holy week ceremonial as carried out not only by the pope, but also by the bishops in most of the great cathedrals abroad. It was also practised by kings and other royal and noble personages, even down to a very recent date.

WASHINGTON, a Pacific Coast state, lies between lat. 45° 32′ and 49° n.; long., 117° to 124° 48′ w.; bounded on the n. by British Columbia and the Strait of Juan de Fuca; on the e. by Idaho; on the s. by Oregon, the Columbia river forming part of the boundary; on the w. mainly by the Pacific Ocean; length from e. to w., 360 m.; breadth, 240 m.; land area, 66,880 sq.m.; gross area, 69,180 sq.m., or 44,275,200 acres.

History.—Washington originally formed part of Oregon, which was discovered by Juan de Fuca, a Greek, in 1592; visited by a Spanish navigator in 1775, and three years after by Capt. Cook. In 1787 Berkeley, an Englishman, rediscovered the strait of Fuca, which had been missed by others. Capt. Gray, an American, visited the coast in 1791; and the English Capt. Vancouver in 1792; Capts. Lewis and Clark explored the interior during the presidency of Jefferson, and settlements were made by the Hudson Bay Company in 1828. In 1838 a Roman Catholic mission was established at Vancouver, and in 1845 Americans settled at Tumwater. It was constituted a separate territory in 1853, Mar. 2, and at that time comprised the region lying between the Pacific and the summit of the Rocky Mountains, and north of the Columbia river and the 46th parallel. Wars with the Indians in 1855 and 1858 retarded immigration, but in the latter year 15,000 persons were attracted by the discovery of gold at Frazer's river, many of whom became permanent settlers. In 1859, when Oregon was admitted into the union, the region between the eastern boundary of that state and the Rocky Mountains and north of the 42d parallel was added to Washington Territory. It then comprised 193,071 square miles, embracing what is now Idaho and parts of Montana and Wyoming.

There have been one or two tides of emigration caused by discoveries of gold, but the country is too remote to equal in inducements the states and territories lying to the east and south. In Feb., 1889, congress passed an enabling act, permitting Washington to form a state government, and on Nov. 11 it was admitted to the union.

Topography.—The great range of the Cascade Mountains, a continuation of the Sierra Nevada, passes through from n. to s. about 100 m. from the coast. Its highest peaks, all of them extinct volcanoes, are Mt. Baker, in lat. 48° 44′, 10,827 ft.; Mt. Rainier or Tacoma, 14,444 ft., but easily ascended for 11,000 ft.; Mt. St. Helena, 9,750 ft., a symmetrical, snow-covered cone; Mt. Adams, 9000 ft. The country between this range and the Pacific is densely timbered, contains a few fertile prairies and some rough and broken mountain lands. It includes the Puget Sound basin, Shoalwater Bay basin, the Chehalis Valley, and the Lower Columbia Valley. The Pacific Coast line is about 180 m. long; Puget Sound, with its inlets and arms—Juan de Fuca Strait, Admiralty Inlet, and Hood's Canal—has a surface of 2000 sq.m.; and a shore line of 1594 m. Its waters are free from shoals, the boldness of the shores gives harbors for the deepest vessels, and for safety in navigation the sound is unequaled. The Strait of Juan de Fuca is 95 m. long, with an average width of 11 m., and divides into Rosario Sound on the e. and the Canal de Haro on the w., there enclosing the archipelago of W. sound and connecting with the Gulf of Georgia on the n. The rise and fall of the tides is 18 ft. From the e. end of the strait Puget Sound extends southward for 80 m. The inlets and bays vary from 2 to 8 m. in length and from 1 to 6 m. in breadth. Among them are Neah Bay, Ports Discovery, Ludlow, Madison, Gamble, Orchard, and Blakely, Elliott's or Seattle, Tacoma, Steilacoom, Utsalada, and Bellingham Bays; Budd's Inlet (Olympia) and Penn's Cove. Hood's Canal, a narrower channel on the west, extends 60 m. Bellingham, on the eastern shore of the Gulf of Georgia, has a tide of 20 feet. There are also large and deep harbors, suitable for naval stations, on the Strait of Juan de Fuca. The important bays on the coast are Shoalwater and Gray's Harbor, both accessible to large vessels. The prominent headlands are Cape Disappointment, or Hancock, at the mouth of the Columbia, and Cape Flattery, at the entrance of Fuca Strait. The chief rivers entering Puget Sound are the Des Chutes, Puyallup, Duwamish, White, Black, Cedar, Snohomish, Skagit, Swinamish, Lummi, and Skokomish. Some are navigable, and many have notable fall and water-power. Eastern Washington comprises the valley of the Columbia and its large affluents, the Clarke, Spokane, and Lewis or Snake rivers, and the Spokane Plains or Plateau.

The Columbia river affords ship navigation nearly to the Cascade Mountains, and throughout the state this river and its largest affluents, the Lewis and Clarke, afford steamboat navigation, with occasional interruption from rapids. The Lewis flows north,

AREA AND POPULATION OF WASHINGTON AND OREGON BY COUNTIES.

(ELEVENTH CENSUS: 1890.)

WASHINGTON.

	Area in Square Miles.	Population.		Area in Square Miles.	Population.
Adams	1,908	2,098	Mason	996	2,826
Asotin	640	1,580	Okanogan	7,258	1,467
Chehalis	2,104	9,249	Pacific	896	4,358
Clallam	1,824	2,771	Pierce	1,376	50,940
Clarke	648	11,709	San Juan	600	2,072
Columbia	864	6,709	Skagit	1,916	8,747
Cowlitz	1,124	5,917	Skamania	1,636	774
Douglas	4,552	3,161	Snohomish	1,720	8,514
Franklin	1,244	696	Spokane	1,680	37,487
Garfield	672	3,897	Stevens	6,194	4,341
Island	220	1,787	Thurston	768	9,675
Jefferson	1,688	8,368	Wahkiakum	244	2,526
King	1,944	63,989	Walla Walla	1,296	12,224
Kitsap	392	4,624	Whatcom	2,468	18,591
Kittitas	3,344	8,777	Whitman	2,124	19,109
Klickitat	3,176	5,167	Yakima	5,760	4,429
Lewis	2,308	11,499			
Lincoln	2,296	9,312	Total	66,880	349,390

OREGON.

	Area in Square Miles.	Population.		Area in Square Miles.	Population.
Baker	1,970	6,764	Linn	2,700	16,265
Benton	1,370	8,650	Malheur	9,936	2,601
Clackamas	1,684	15,233	Marion	830	22,934
Clatsop	815	10,016	Morrow	2,020	4,205
Columbia	693	5,191	Multnomah	440	74,884
Coos	1,750	8,874	Polk	615	7,858
Crook	8,150	3,244	Sherman	510	1,792
Curry	1,590	1 709	Tillamook	1,525	2,932
Douglas	4,875	11,864	Umatilla	2,885	13,381
Gilliam	1,700	3,600	Union	3,035	12,044
Grant	5,472	5,080	Wallowa	2,890	3,661
Harney	10,600	2,559	Wasco	3,315	9,183
Jackson	2,880	11,455	Washington	645	11,972
Josephine	1,605	4,878	Yam Hill	640	10,692
Klamath	5,520	2,444			
Lake	8,040	2 604	Total	94,560	313,767
Lane	3,860	15,198			

WASHINGTON
BRITISH COLUMBIA
VANCOUVER ISLAND
Strait of Juan de Fuca
STEVENS
LINCOLN
DOUGLAS
OKANOGAN
WHATCOM
SKAGIT
SNOHOMISH
KING
PIERCE
KITTITAS
YAKIMA
KLICKITAT
SKAMANIA
CLARKE
COWLITZ
LEWIS
THURSTON
MASON
CHEHALIS
PACIFIC
WAHKIAKUM
CLALLAM
JEFFERSON
ADAMS
FRANKLIN
WHITMAN
GARFIELD
COLUMBIA
WALLA WALLA
SPOKANE
Seattle
Tacoma
Spokane
Walla Walla
Olympia
Port Townsend
New Whatcom
Fairhaven
North Yakima
Ellensburg
Vancouver
Portland
Astoria
The Dalles
Pendleton
Colfax
Dayton
Pomeroy
Lewiston
Moscow
Great Plains of the Columbia
GRAND COULEE
YAKIMA INDIAN RESERVATION
MT. RAINIER
MT. ST. HELENS
MT. ADAMS
MT. BAKER
MT. OLYMPUS
Columbia R.
Snake
Cape Flattery
Cape Disappointment
Gray's Harbor

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forming the southern portion of the Idaho boundary for 30 miles, and then entering Washington, flows west 150 miles to the Columbia. It is navigable to the Idaho border. The largest lakes are Washington, with an area of 60 sq.m., and an average depth of 200 ft.; Union, American, and Whatcom, all lying w. of the Cascade Mountains. The largest body of water in eastern Washington is Lake Chelan. The scenery of Puget Sound is unsurpassed in the United States.

Geology and Mineralogy.—The principal geological divisions in western W. are the Cambrian and Silurian, eozoic, cretaceous, and tertiary. The northern portion, Blue mountains, and Coast Range are referred to the azoic period; the central and s.e. portions are of volcanic formation. Western W. has been called the Pennsylvania of the Pacific Coast, by reason of its coal supply, the principal fields lying in or near the Puget Sound basin. Lignite, bituminous, semi-bituminous, and anthracite are found. The Puyallup fields yield coking coal chiefly. Gold is found on the Yakima River; silver, near Spokane. Iron ore is abundant; salt is abundant on the Spokane plateau, and petroleum in the Puyallup Valley.

Zoology.—This is largely that of Oregon. Among wild animals are the mountain-goat, bear, deer, antelope, marten, pecan, sewellel, beaver, otter, and prairie dog. Among birds and wild-fowl are the great horned owl, red owl, fish-crow, raven, hairy woodpecker, cedar bird, grouse, butcher bird, whippoorwill, and white-bellied swallow. The fish include the eulachon or smelt, black cod, salmon of several species, two species of trout, bass, halibut, herring, pickerel.

Botany.—The flora is that of Oregon. The estimated area of timber land is 20,000,000 acres. The timber of the Pacific slope is of great richness; the red fir and yellow fir (*abies Douglasii* and *a. grandis*), growing 300 ft. high, and from 6 to 8 ft. in diameter. Cotton-wood and willows abound in the coast valleys, and among other deciduous trees are the maple and ash.

Climate and Soil.—There are two seasons, the dry and the rainy, the latter comprising what are called the winter months (October to April), or the season during which rains prevail. Yet sunshiny days are not rare; snows, in western W. at least, are light, and sometimes do not occur at all. The climate of western W., owing to the Japan current, is relatively warm in winter and cool in summer. Destructive storms are unknown, and thunderstorms are moderate. Of 34 winters recorded on Puget Sound, only 6 were so severe as to necessitate the housing of stock. The average annual rainfall in w. Washington in 2–40 years was 52.52 inches, in e. Washington, 16.51 inches; mean annual temperature in w. Washington, 50.4°, in e. Washington, 49.7°. The rainfall is the heaviest in the w. part of the Pacific coast cos., ranging 79–107 inches.

The alluvial soil of western W., particularly in the river valleys, is very rich. The Upper Columbia Valley has a soil from one to twenty feet in depth, largely a light-colored loam particularly well adapted for wheat. In the Palouse country a black loam with a clay subsoil occurs.

Agriculture. — The staple products in Washington are wheat, barley, oats, hay, apples, and hops. In western Washington much of the tide land has been reclaimed, and is of great fertility. White clover and bunch grass abound in the eastern counties, and here are the principal grazing lands. Much of the land devoted to wheat is from 1500 to 3000 ft. above the sea; hundreds of miles of irrigating canals are in operation, and the annual production averages 8,500,000 bushels. Indian corn and large quantities of vegetables, fruits, and grasses are produced. Apples, pears, prunes, and small fruits thrive and are largely cultivated. The Puyallup Valley near Tacoma is becoming famous for its hops. The yield is sometimes as high as 1500 lbs. to the acre, and the annual production exceeds 8,300,000 lbs.

Industries, etc.—The U. S. census of 1890 reported for Washington, 1543 manufacturing establishments, employing $34,369,735 capital and 20,366 persons, paying $12,658,614 for wages, and $19,917,057 for materials, and having a combined output valued at $41,768,022. The principal manufactures, according to value of output, are lumber, saw, and planing mill products, flour and grist mill products, unmanufactured timber, brick and tile, foundry and machine shop products, and malt liquors. Tacoma has large lumber and smelting industries; Seattle, a fine coast trade, while its local manufactures are estimated at $10,000,000 annually; Anacortes, a railway center and port for steamship lines; and San Juan Islands, large quantities of lime. The coast waters and rivers teem with valuable food fish, including herring, smelt, cod, shad, and many others. The salmon fisheries of the Columbia, and of Shoalwater Bay, Gray's Harbor and Puget Sound are very extensive, and the oysters in these coast waters are abundant and particularly esteemed for their fine flavor. From the forests of Douglas or red firs, erroneously called Oregon pine, large quantities of masts and spars, frequently 150 feet in length, are sent to San Francisco, and to Europe, South America and Australia.

Commerce.—There is one customs district, that of Puget Sound, of which Port Townsend is the port of entry. Only two ports in the United States, New York and San Francisco, exceed Port Townsend in the number of American steam-vessels engaged in the foreign trade. Coal, wheat, lumber, salmon, and produce are exported, and from Tacoma are shipped wheat, fruits, hops, cattle, and garden stuff. The total exports of Puget Sound amount to nearly $12,000,000 annually, one-third being to foreign ports, principally China and Japan; and total imports, to over $7,000,000.

Railways.—The principal railroads are the Northern Pacific, the Union Pacific, and their branches, and the Great Northern. The Northern Pacific crosses the Cascade

Range 2837 feet above the sea-level through the Great Cascade tunnel, 9850 feet long and lighted by electricity. The trains descend the western slope by a series of zigzags. The total length of railroads in the state is about 3000 miles of local roads, the capital exceeds $21,000,000; funded debt, $18,000,000; total investment, $40,000,000; cost of roads and equipments, $42,000,000; and net earnings, $400,000.

BANKS.—On Oct. 31, 1896, there were 40 national banks in operation, with combined capital $5,788,000, deposits $6,433,093, reserve $1,951,106, and outstanding circulation $1,274,607; 14 state banks, with capital $550,700, deposits $815,498, and resources $1,445,742; and 5 private banks, with capital $297,309, deposits $1,041,708, and resources $1,567,916.

CHURCHES, EDUCATION, ETC.—The leading religious denominations numerically are the Roman Catholic, Methodist Episcopal, Disciples, Baptist, Presbyterian, Congregational, Protestant Episcopal, and Lutheran. The public school population at the close of 1896 was 108,800; enrollment, 90,113; average daily attendance, 63,200. The higher institutions include a state university at Seattle; Seattle university; Puget Sound university, Tacoma; Whitman college, Walla Walla; St. James college, Vancouver; Walla Walla college, College Place; Colfax college, Colfax; Whitworth college, Sumner; State agricultural college and school of science, Pullman; normal schools at Cheney and Ellensburg; and manual training schools at Seattle and Spokane. There were 20 libraries of 1000 volumes and upward each, with a total of over 76,000 volumes, and (1897) 219 periodicals of all kinds.

GOVERNMENT, ETC.—The capital is Olympia. The executive officers are a gov., lieut.-gov., and secretary, auditor, treasurer, and supt. of public instruction. The legislature consists of a senate and a house of representatives, senators elected for four years, representatives for two years. The judicial power is vested in a supreme court of five judges, serving four years and receiving $3000 each, district courts, a probate court in each co., and justices of the peace. Every male citizen 21 years of age is allowed to vote if he has lived in the state one year; county, ninety days; in the town and precinct, thirty days. New ballot laws based on the Australian system (q. v.) were adopted in 1890. W. is represented in congress (1897) by two representatives and two senators. In 1892 it cast four electoral votes for Harrison and Reid; in 1896, four for Bryan and Sewall.

FINANCES.—The 1890 United States census report gave the state debt as $300,000; county debt, $1,507,786; municipal debt, $1,046,510; school district debt, $291,362; total combined debt, less the sinking fund, $3,145,698. The total assessed valuation in 1896 was $204,677,668; bonded debt, 1897, $300,000, floating debt, $1,832,473.

The National Guard of the state has an authorized strength of 1879 officers and men and an actual strength of about 1050. The total liable to military duty is over 60,000.

The state hospitals for the insane are at Steilacoom and Medical lake; the penitentiary at Walla Walla; the state school for defective youth at Vancouver; the state reform school at Chehalis; and the state soldiers' home at Orting.

POPULATION.—There are 34 cos.; for pop., 1890, see Census Tables, Vol. XV. The total pop. 1853, was 3965; 1870, 23,955; 1880, 75,116 (15,861 of foreign birth); male, 45,977; female, 29,143; colored, 7917—3187 Chinese, 4405 civilized or taxed Indians; dwellings, 15,512; families, 16,380; persons to sq.m. 1. 1; engaged in agriculture, 12,781; in mining and manufactures, 7296. Pop. in 1890, 349,390. The largest cities, 1890, were Seattle, 42,837; Tacoma, 36,006; Spokane, 19,922; Walla Walla, 4709.

WASHINGTON, a co. in s.w. Alabama, bounded on the e. by the Tombigbee river; 1050 sq.m.; pop. '90, 7935. Co. seat, St. Stephens.

WASHINGTON, a co. in n.w. Arkansas; containing a sandstone called millstone grit; 927 sq.m., pop. '90, 32,024. Co. seat, Fayetteville.

WASHINGTON, a n. eastern co. of Col.; 1080 sq.m.; pop. '90, 2301. It is drained by the South Platte river. Co. seat, Akron.

WASHINGTON, a co. in n.w. Florida, having the gulf of Mexico on its s. border; 1340 sq.m.; pop. '90, 6426. Co. seat, Vernon.

WASHINGTON, a co. in central Georgia; drained by the Ogeechee and other rivers; 688 sq.m.; pop. '90, 25,237. Co. seat, Sandersville.

WASHINGTON, a co. in western Idaho, on Snake river; 2700 sq.m.; pop. '90, 3836. Co. seat, Weiser.

WASHINGTON, a co. in s. Illinois, bounded on the n. by Kaskaskia river; 540 sq.m.; pop. '90, 19,262. Co. seat, Nashville.

WASHINGTON, a co. in s. Indiana, bounded on the n. by the Muscatatuck river; 500 sq.m.; pop. '90, 18,619. Co. seat, Salem.

WASHINGTON, a co. in s.e. Iowa, bounded on the n.e. by the Iowa river; 576 sq.m.; pop. '90, 18,468. Co. seat, Washington.

WASHINGTON, a co. in n. Kansas; 900 sq.m.; pop. '90, 22,894. Co. seat, Washington.

WASHINGTON, a co. in central Kentucky; 300 sq.m.; pop. '90, 13,622. Co. seat, Springfield.

WASHINGTON, a parish in e. Louisiana, bounded on the e. by the Pearl river; 660 sq.m.; pop. '90, 6700. Parish seat, Franklinton.

WASHINGTON, a co. in s.e. Maine, having the Atlantic ocean on the s. ; 2452 sq.m. ; pop. '90, 44,482. Co. seats, Machias and Calais.

WASHINGTON, a co. in n. Maryland, bounded on the n.w. by the Potomac River, drained by the Antietam and other rivers, having the Blue Ridge or South mountain on its e. border ; 435 sq.m.; pop. '90, 39,782, chiefly of American birth, inclu. colored. Co. seat, Hagerstown.

WASHINGTON, a co. in e. Minnesota, having the Mississippi River for its s. boundary ; 400 sq.m.; pop. '90, 25,992, chiefly of American birth, with colored. Co. seat, Stillwater.

WASHINGTON, a co. in w. Mississippi, having the Mississippi River for its w. boundary, separating it from Arkansas ; partly subject to inundation ; 880 sq.m.; pop. '90, 40,414. Co. seat, Greenville.

WASHINGTON, a co. in s.e. Missouri, hilly, well timbered, and containing vast mineral resources ; 780 sq.m.; pop. '90, 13,153, chiefly of American birth, inclu. colored. Co. seat, Potosi.

WASHINGTON, a co. in e. Nebraska, having the Missouri River for its e. boundary, consisting of fertile prairies well watered ; 381 sq.m.; pop. '90, 11,869, chiefly of American birth. Co. seat, Blair.

WASHINGTON, a co. in e. New York, having Lake George for its n.w. boundary, with Vermont on the e. and the Hudson River on the w.; 861 sq.m.; pop. '90, 45,690. Co. seat, Argyle.

WASHINGTON, a co. in e. North Carolina, bounded on the n. by Albemarle Sound, having the mouth of the Roanoke River on the n.w. margin ; 360 sq.m.; pop. '90, 10,200. Co. seat, Plymouth.

WASHINGTON, a co. in s.e. Ohio, bounded on the s. and s.e. by the Ohio River, containing valuable petroleum wells ; 635 sq.m.; pop. '90, 42,380, chiefly of American birth. Co. seat, Marietta.

WASHINGTON, a co. in n.w. Oregon, bounded on the n.w. by the Coast range ; 645 sq.m.; pop. '90, 11,972. Co. seat, Hillsboro.

WASHINGTON, a co. in s.w. Pennsylvania, bounded on the e. by the Monongahela River ; 890 sq.m.; pop. '90, 71,155. Co. seat, Washington.

WASHINGTON, a co. in s. Rhode Island, having the Narragansett Bay for its e. boundary, on the s. the Atlantic ocean ; 340 sq.m.; pop. '90, 23,649. It has extensive woolen manufactures. Co. seat, Kingston.

WASHINGTON, a co. in s.w. S. Dakota, drained by the White River. It was formed in 1883, and contains a large part of the "bad lands" tract; 1510 sq. m.; white pop. '90, 40.

WASHINGTON, a co. in e. Tennessee; 344 sq. m.; pop. '90, 20,354, chiefly of American birth. Co. seat, Jonesboro.

WASHINGTON, a co. seat in s.e. Texas ; 600 sq.m.; pop.'90, 29,161. Co. seat, Brenham.

WASHINGTON, a co. in s.w. Utah ; 2446 sq.m.; pop. '90, 4009, chiefly of American birth. Co. seat, St. George.

WASHINGTON, a co. in n. Vermont, containing a part of the Green mountains and Camel's Hump, a peak rising 4088 ft. above the level of the sea ; 703 sq.m.; pop. '90, 29,606. Among its mineral products are verdantique marble, dolomite, serpentine, slate, and granite. Co. seat, Montpelier.

WASHINGTON, a co. in s.w. Virginia, bounded on the n.w. by Clinch mountain, contains a long ridge called Walker's mountain ; 622 sq.m.; pop. '90, 29,020. It has extensive beds of solid salt. Co. seat, Abingdon.

WASHINGTON, a co. in s.e. Wisconsin, drained by the Milwaukee, Mequon, and Rubicon rivers ; 430 sq.m.; pop. '90, 22,751, chiefly of American birth, with colored. Co. seat, West Bend.

WASHINGTON, city; seat of government of the United States of America; coextensive with the District of Columbia, on the Potomac river, where the Anacostia, or East Branch, joins the main stream, and within reach of the ocean tides. It is in latitude 38° 53′ to 39° north ; longitude, 76° 58′ to 77° 6′ west ; mean temperature, 54.7° ; forty miles southwest of Baltimore, 136 from Philadelphia, 230 from New York, 3167 from San Francisco, 106 from the mouth of the Potomac, and 185 from the Atlantic Ocean. The river at Washington is one mile wide and will float coastwise ships of ordinary draught.

The original site of this city was purchased from the aborigines in 1663 by an Englishman named Francis Pope, who called the place Rome, and the branch which empties into the Potomac the Tiber ; the elevated plateau received the name of Capitoline Hill. This "Pope of Rome," as he called himself, "builded better than he knew."

After the revolutionary war several states clamored for the seat of government, as it had been necessary to move it from place to place in order to avoid destruction by the armies As Maryland and Virginia offered the prescribed amount of land, 100 miles square, this district was finally accepted in 1790, and was first called the Territory of

Columbia, and finally the Federal District of Columbia (q.v.). In accordance with the act of March 30, 1791, the boundaries of the city and the location of the public squares and buildings were determined by President Washington himself, who thus, at the height of his fame, availed himself of the skill in surveying he had acquired in his youth. He called it the Federal City, but after his death it received his name. The topographical plan is the result of French influence, as the place was surveyed and laid out by Andrew Ellicott under the direction of Major L'Enfant, a French engineer who had served in the Continental army; he took the city of Versailles for his model. The plan of the city is very peculiar. It stands on an irregular plateau, forty feet above the Potomac and seventy-five feet above the sea-level, commanding a beautiful and picturesque landscape, best seen from the portico or dome of the Capitol, and which drew from Humboldt the declaration: "In all my travels I have not seen a more charming panorama." The numbered streets, increasing north from the Capitol and south from the Capitol, cross at right angles, the lettered streets extending east and west from the Capitol, which is always the starting-point of enumeration. North, South, and East Capitol streets also intersect here. Crossing all these rectangular streets diagonally, radiating from the Capitol, are twenty-one broad avenues named for the states of the Union. The circles, squares, and triangles formed by these intersections add much to the beauty of the city, as they open up delightful views of public buildings, monuments, and long avenues.

The plan was so extensive and the actual growth of the city so small that Washington was often satirically called "The City of Magnificent Distances." In 1800 it was said, "The Capitol is on an eminence near the centre of the immense country called here 'the city.' There is one good tavern, and several other houses are finished or being built." There were only 3000 inhabitants, and for years members of Congress lived principally in Georgetown. As the land around the Capitol commanded a high price, the healthful portions of the city remained unoccupied for more than fifty years. It was principally a deep morass covered with alder bushes. As soon as the north wing of the Capitol was finished, the corner-stone of which was laid in 1793, the public archives were transferred in a sloop from Philadelphia, and in the year 1800 Congress held its first session here. In 1814 a British army of 4500 men conquered the Americans at Bladensburg and took possession of Washington, after destroying the public buildings. It was not until 1851 that any attempt at draining and adorning the reservations and parks was made; work was commenced under the skillful guidance of Andrew J. Downing, but his death the next year and the neglect of Congress arrested it for twenty years. During the civil war the city was threatened by the Confederate forces, until, on May 23, 1861, the simultaneous advance of Wood, Heintzelman and Ellsworth routed them. Its fortifications "consisted of sixty-eight enclosed forts and batteries, having an aggregate perimeter of about fourteen miles, and emplacements of 1120 guns; of ninety-three unarmed batteries, having 401 emplacements; and of twenty miles of infantry trenches. The entire circuit of the line, exclusive of the chain bridge works and of the stretch across the Potomac from Fort Greble to Fort Lyon, was thirty-three miles; thirty-two miles of military roads, besides the existing streets and avenues of the district afforded the means of communication." These works were serviceable for the safety of the city during the war, but have been dismantled, with the exception of Fort Meyer, on Arlington Heights, now a cavalry station and the quarters of the signal corps of the army. Throughout the war Washington was a vast depot for military supplies; long trains of army-wagons were almost constantly passing through its streets; immense hospitals for the sick and wounded were erected, and many churches, public institutions, and the Capitol itself were at times given up to this service. During those critical years property greatly depreciated and no new buildings were erected. At the close of the war, May 23, 24, 1865, Washington was the scene of the grandest military display ever witnessed in America, when the scarred heroes with their tattered banners defiled with honor past the President, Andrew Johnson (q.v.), the successor of Abraham Lincoln (q.v.).

No government buildings having ever been erected on the west side of the Potomac river, Maryland and Virginia petitioned that the Virginia portion be retroceded to that state, and this was done in 1846. In 1871 arose a new era for Washington. The older city of Georgetown, which was founded in 1751, was in 1871 incorporated with this city, and is now locally called West Washington. It is picturesquely situated on a succession of eminences and contains many handsome residences; several bridges and lines of electric street railroads connect the two parts. After its incorporation as a city in 1802, the people elected their own mayors until 1871, when a territorial government was substituted for the municipal, and Washington was controlled by a governor and legislature. Sweeping reforms, which greatly improved the city, so increased the public debt, that in 1874 Congress again changed the government, and at present the city is ruled by the President and Congress through a board of three commissioners; its inhabitants have no vote either in the national or local government. There is a supreme court of six justices besides other officials. The common law of England prevails, modified by acts of Congress, and enactments still in force from former municipal governments. The debt is placed in the hands of the treasurer of the United States, and the revenues are secured by taxes on private property and privileges, and appropriations by Congress. The annual expenses of the city amount to nearly $6,000,000.

The magnificent location of Washington on a tongue of land between the broad

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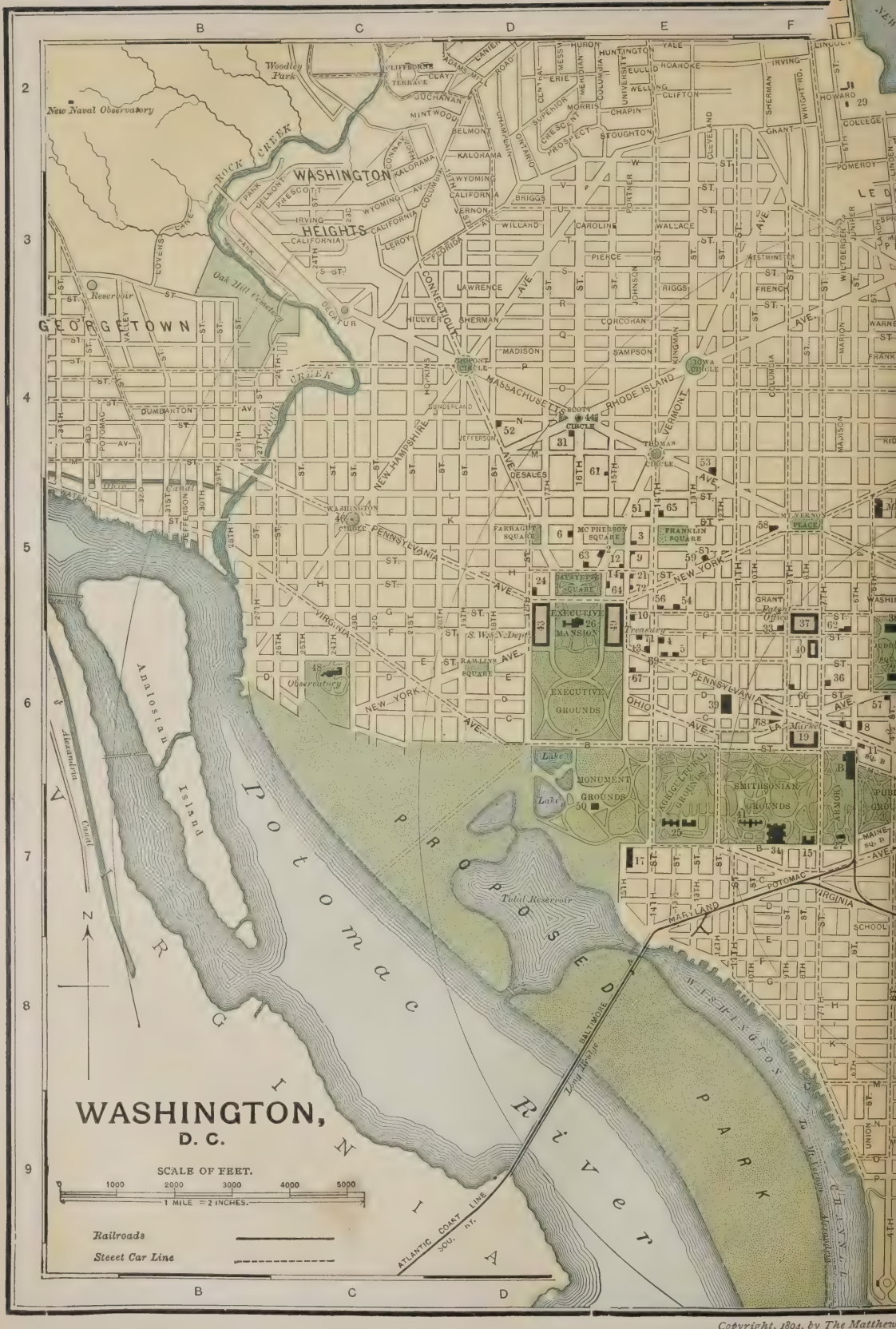

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Potomac, the East Branch, and Rock Creek, a dashing hill stream, lends itself admirably to the grand scale adopted by its designers. Surrounded by an amphitheatre of hills, rising in some places to an elevation of 150 to 400 feet, its appearance, crowned by the Capitol, ninety feet above the level, is imposing and beautiful. Covering an area of seventy square miles, including Georgetown, more than one-half of its whole extent is occupied by parks and government reservations. Besides numerous small enclosures Washington has a zoological garden, covering 140 acres, and the Rock Creek park of more than 1500 acres, purchased in 1890 at a cost of $1,200,000, which extends for miles through forests and over hills along the banks of a picturesque stream. The soil of the adjacent country is light sandy loam and clay, the farming products of which are worth $4,000,000 annually. Snow never remains on the ground and the Potomac does not freeze over until January. The mean temperature is the same as that of San Francisco.

The streets and avenues are the widest in the world, from seventy to 160 feet, paved with asphalt and concrete and lined with shade trees. Many of them have a quadruple row of trees, including several thousand varieties. Among the smaller parks arising from the intersection of the streets are Lafayette, beautifully laid out north of the White House, and Lincoln Square, which marks the spot originally intended to be the geographical centre of the United States. A park of 300 acres stretches from the Capitol to the Washington Monument (q.v.), called The Mall, and to this is added 700 acres reclaimed from the Potomac, which includes the United States Fish Ponds and the Propagating Gardens. Stretching entirely across the city from northwest to southeast, and reaching from the Anacostia River to Kalorama Heights and Rock Creek, is Massachusetts Avenue, 160 feet wide, and for three miles graced with two rows of interlacing linden trees on either side. It is the grandest avenue on the continent, being four miles and a half in length. Pennsylvania Avenue, nearly as long, a section of which leads from the commanding portico of the Capitol to the imposing front of the Treasury Building, is the main street of the city, on which are located some of the principal hotels, stores, and theatres. Many of the circles and squares are adorned with statues, among them the equestrian figures of Washington, Scott, and General Thomas, and the standing figures of Garfield and Admirals Farragut and Dupont.

Favorite drives out of the city take visitors to the Soldiers' Home, with its enchanting view to Cabin John Bridge; to Rock Creek valley, rich in flowers and forest trees; to the heights above Georgetown, with a wide and impressive prospect, and to Arlington Heights, on the Virginia shore, where the national cemeteries, containing 17,000 Union soldiers' graves, are located. One mile east of the Capitol is the Congressional Cemetery of thirty acres, containing the tombs of a number of Congressmen. Oakhill, in Georgetown, is the resting-place of many distinguished men, including John Howard Payne, the author of "Home, Sweet Home." The oldest cemetery is at Rock Creek. The region northwest of the White House, formerly pasture ground, and known as "The Slashes," is now covered with elegant residences, the homes of cabinet officers, Congressmen, the foreign legation, and other distinguished men, surrounded by green lawns and beds of bright flowers, which give it a distinctive character.

Amid the luxurious foliage of the city gleams the marble whiteness of the majestic Capitol and the magnificent Government Buildings, erected at the cost of more than $100,000,000; taken as a group they are matchless in elegance. The Capitol is the most conspicuous object, its white dome being visible for miles around. Its lofty position, massiveness of form, beauty of material, and harmonious effect have elicited a general opinion that it is one of the most impressive edifices of modern times. When the structure was burned by the British, in 1814, it consisted of two wings only (the second one having been added in 1811), connected by a temporary passage-way or scaffolding. The main building is of sandstone, painted white, in rich Corinthian architecture, and covers, with the wings of white marble, three and one half acres of ground. Each of these sections has an imposing colonnade front on the eastern side; the central portico, being the finest, is used for the main entrance. The foundation of the rotunda was laid in 1818, March 2, and the main building was completed in 1827. The new wings were designed by Henry B. Latrobe, who was succeeded in 1817 by Charles Bulfinch, of Boston. He, in turn, was followed by Thomas U. Walter, who completed the new dome and the wings; the Hall of Representatives was occupied in 1857, and the Senate Chamber in 1859. The work progressed during the civil war, and on December 2, 1863, the statue of Freedom was placed on the dome. The entire cost of construction, extension, and repairs, exceeds $15,000,000.

The dome, 285½ feet high and 135¼ feet in diameter, is one of the most perfect in the world, and is exceeded in size only by St. Peter's, St. Paul's, the Invalides, and St. Joseph's. Surmounting it and supporting Crawford's colossal statue, nineteen and one quarter feet high, is a peristyled lantern, giving a classical finish to the whole. The 4000 tons of iron used in its manufacture is arranged in leaves or folds, which move with the atmospheric changes like the flutterings of a fan, glistening white in the sun. The rotunda, under the dome, ninety-six feet in diameter and 180 feet high, is adorned with historical paintings by Trumbull, Weir, Chapman, Vanderlyn, and Powell, and a striking frieze by Brumidi, representing scenes from American history; the Apotheosis of Washington, with figures and allegorical groups, also by Brumidi, forms the ceiling painting. By a staircase in one corner the famous whispering gallery is reached, in the interior of the dome, and the ascent is made to the lantern, from which a magnificent view of the city and surrounding country may be obtained.

From this superb piece of architecture down to the bronze doors, covered with statuettes and bas-reliefs illustrating scenes in the life of Columbus, by Randolph Rogers, cast in Munich in 1851, and equalled only in the old European cities, and the imposing Corinthian porticoes, with their wealth of statuary, scenes of surpassing interest constantly rise before the visitor—the massive marble staircases of the wings leading to the Senate Chamber and the Representative Hall (which is the largest legislative room in the world), adorned with historical paintings; the immense Doric Columns of the crypt; the National Statuary Hall, an artistic Greek Chamber, which each state assists in adorning, by presenting the statues of two of its most illustrious men; the Marble Room, said to be unequalled in the world, built entirely of native marble; the Supreme-Court room; the elegant Reception and Committee Rooms and Corridors; the President's Room, the most richly decorated in America, and the old Congressional Library, the largest in the country, containing 900,000 volumes, which are filled with the choicest treasures of literature. As a copy of every publication for which a copyright is taken out must be sent to the library, the number of books has increased so rapidly that a separate building has been erected e. of the Capitol. The enormous structure, 470 feet long and 340 feet wide, was virtually completed late in 1897, and is one of the finest buildings devoted to a library in the world. Its estimated cost is $6,000,000.

Committee Rooms, Library Rooms, Storage Rooms, etc., are arranged in the basement of the Capitol. The walls and ceilings of these rooms and corridors are many of them, handsomely decorated. In a small room under the Colonnade are six columns, formed like Indian corn, which are said to have been designed by Jefferson.

A park of about fifty acres surrounds the Capitol, laid out by Olmsted. In the open ground on the eastern side, opposite the grand Façade, stands a colossal statue of George Washington, by Greenough (q.v.). To the right is a marble group, the "Settlement of America," by the same sculptor, and to the left is the "Discovery of America," a figure of Columbus, by Persico (q.v.). Above the portico is a bas-relief of the "Genius of America," by Persico, and in the pediment above the north portico a group represents the "Civilization of the United States." It is on the broad steps of this central portico that the Presidents of the United States are inaugurated. On the west side of the building a beautiful marble terrace, 884 feet long, reached by two broad flights of steps, has been constructed, which adds greatly to the appearance of that side of the edifice. Near this terrace is an immense statue of Chief Justice Marshall, by Story. In this locality are also Simmons' Naval or Peace Monument and the statue of President Garfield. Joining the Capitol grounds on the west is The Mall, where are located the Botanical Gardens, the Department of Agriculture and the Smithsonian Institution (q.v.). The Department of Agriculture is a building of brick and brown stone, in the Renaissance style, with greenhouses, graperies, and experimental grounds around it, covering ten acres. The business of the Department is to distribute over the country seeds, plants, and general agricultural information.

On the south side of The Mall is also situated the Army Medical Museum, containing a library of 200,000 volumes and a large assemblage of specimens representing the effects of wounds, diseases and surgical operations, models of barracks, hospitals, ambulances, and the microscopic department is admirably arranged. Near this is the National Museum, containing unsurpassed collections of great interest, which include specimens of natural history, ethnology, antiquities, geology, arts, and industry. Here are bronzes, Japanese curiosities, china, tapestries, art and textile industries, paintings, etc. Near the Department of Agriculture is the Bureau of Engraving and Printing, where paper money and bonds are manufactured.

About one mile and a quarter northwest of the Capitol, approached by a magnificent avenue, 160 feet broad, and lined with trees, stands the Executive Mansion, otherwise known as the White House, surrounded by a cluster of superb granite buildings occupied by the various Departments. The President's House is a two storied freestone building, 170 feet long and eighty-six deep, with a handsome portico of eight Ionic columns on the north and a semicircular Ionic colonnade on the south. On the west side is a range of conservatories, and twenty acres of highly cultivated grounds surround it, with an addition of fifty-five acres extending to the Potomac. The corner-stone was laid in 1792, and it was modelled after the Duke of Leinster's palace in Ireland. President Adams was its first occupant, in 1800. After it was burned by the British in 1814, the blackened walls were painted white; hence its popular name the "White House." It was rebuilt in 1818. The largest apartment, the historic East Room, is eighty feet by forty, and twenty-two feet, and is open to the public daily from ten o'clock until two. Other beautiful rooms are named from the color of their respective decorations and furniture in red, blue, and green. The Reception Rooms, which contain portraits of the Presidents and their wives, are shown by special order only.

In the immediate vicinity of the Executive Mansion is the immense granite building in the Roman Doric style, occupied by the State, War, and Navy Departments, which measures 567 feet in length and 471 feet in breadth, enclosing two courts. It was erected in 1871–88, cost $10,000,000, and is the largest granite building in the world, the huge blocks weighing from ten to twenty tons. The State Department occupies the south wing, and requires the services of 1300 persons to administer its affairs. Here are seen the original Declaration of Independence and Washington's sword and commission. The War Department has possession of the centre and the northern and western wings, with a force of 1500 clerks and 3000 men employed outside. It is the headquarters of

the army of 27,000 men. The Navy Department is in the eastern part of the building, and here are models of war-ships, portraits, etc., and a library of 30,000 volumes. On the east and opposite side of the White House is the Treasury Building, an immense structure 468 feet long and 264 feet wide, with an Ionic colonnade on the east front, and surrounded by porticoes. Here are the Cash Room, the Redemption Division, and the Silver Vaults. The Secret Service Division has a collection of forged money and portraits of forgers.

About half way between the Capitol and the White House is the Department of the Interior, otherwise called the Patent Office, an immense building 453 feet long and 331 feet deep, in Doric architecture of marble, freestone, and granite. The halls of the upper floor contain an extensive collection of patents and models, about half a million having been granted in the United States since 1836. There is nothing like it in the world. The Pension Building is an enormous brick structure, resembling an Italian palace, surrounding a court surmounted by a terra-cotta frieze, the glass roof of which is supported by eight lofty pillars. It will accommodate about 20,000 people at an Inauguration Ball.

Opposite the Patent Office is a highly ornamental structure, occupied by the Post Office Department, which began operations as early as 1789.

The Corcoran Art Gallery is an ornament to the city, located near the War Department. It was built and richly endowed by the late William W. Corcoran, and is the receptacle of one of the finest collections of paintings and statuary in America. Statues of famous artists adorn the outside of the building. The Government Printing Office and the Washington Barracks are historical buildings. The Washington Navy Yard dates from 1804, and contains the great national cannon foundry, established by the first Cleveland administration, and it has manufactured most of the armament of the new gun-boats and cruisers. Near by are the Marine Barracks. The United States Naval Observatory is on the Potomac, between Washington and Georgetown, and it is admirably equipped for astronomical study. From the flag-staff on the principal building a signal ball is dropped daily at noon, transmitting by telegraphic connections the mean time all over the United States. Another edifice has been specially adapted to the reception and employment of the great equatorial telescope, made by Alvan Clark, and mounted in 1873. It has an object glass of twenty-six inches, and cost nearly $50,000. The Signal Office and Weather Bureau are also of interest. The United States Arsenal lies at the southern point of the city, between the Potomac and the Anacostia rivers, and has pleasant grounds, magazines, barracks, and cannon captured from the enemies of the United States.

The U. S. census of 1890 reported for Washington, 2295 manufacturing establishments, employing $28,865,089 capital and 23,404 persons, paying $14,622,264 for wages and $17,194,667 for materials, and having a combined output valued at $39,331,437. Georgetown is the port of entry for Washington, and contains Georgetown university, an old Jesuit institution founded in 1789, and the Convent of the Visitation.

Washington abounds in schools and colleges; white and colored pupils are separated. The most prominent educational institutions are the Columbian university (Baptist), Howard university (non-sect.), Georgetown university (R. C.), Gallaudet college (non-sect.), Gonzaga college (R. C.), the Catholic university of America, and the American university (Meth. Epis., organized in 1891). Howard university and Wayland seminary (Baptist) are exclusively for colored students. The Corcoran School of Science and Arts has a preparatory school attached. There are numerous churches, libraries, newspapers, and magazines. The water supply is brought from the Great Falls of the Potomac by a cylindrical conduit to a distributing reservoir near Georgetown. The sewer system discharges into the Potomac and Anacostia rivers.

Among the unofficial public buildings are the Lafayette square opera house, New National theatre, Academy of Music, Allen's grand opera house, Metzerott Music hall, Pacific building, Masonic hall, Odd Fellows' hall, and Washington market. There are several hospitals, including one for the insane, and eye and ear dispensaries, orphan asylums, the Columbia institution for deaf and dumb, reform school, and many private charitable institutions.

Multitudes of people of every class visit Washington, and its pleasant winter climate makes it an eminently desirable place of residence for persons of wealth and refinement. The fashionable season begins with the meeting of Congress in December. From Christmas to Lent, receptions, balls, and dinners abound. The President receives the calls of the public from twelve to three P. M., on four days in the week, and on January 1. In 1896 the assessed valuations were, real estate, $180,376,908, personal property, $9,532,851, total, $189,909,759; tax rate $15 per $1000. In 1897 the funded debt was $16,933,000.

In the environs are many interesting points—Mt. Vernon (q.v.), Annapolis (q.v.), with the old Carey house, and the Arlington mansion (q.v.), once the residence of George Washington Parke Custis.

Population 1810, 8208; 1820, 13,247; 1830, 18,826; 1840, 23,364; 1860, 61,122; 1870, 109,199; 1880, 177,624; 1890, 230,392.

WASHINGTON, city and co. seat of Davies co., Ind.; on the Baltimore and Ohio Southwestern and the Evansville and Terre Haute railroads; 20 miles e. of Vincennes. It contains a high school, St. Simon's academy, electric light and street railroad plants, waterworks, national and state banks, and about a dozen churches, and has railroad machine shops, grain elevator, various manufactories, and, in the vicinity, several large

coal mines. It has large interests in the shipment of coal, grain, and live-stock. Pop. '90, 6064.

WASHINGTON, city and co. seat of Washington co., Ia.; on the Burlington route and the Chicago, Rock Island, and Pacific railroads; 52 miles n.w. of Burlington. It contains a high school, academy, public library, national and state banks, electric light plant, water supply from deep wells, and about a dozen churches; is principally engaged in agriculture and manufacturing, and has several weekly and monthly periodicals. Pop. '90, 3235.

WASHINGTON, a city in Franklin co., Mo.; on the Missouri river and the Missouri Pacific railroad; 54 miles w. of St. Louis. It contains public high and grammar schools, parochial schools, St. Mary's institute, fair grounds, Turners hall, state bank, electric light plant, waterworks supplied from the river, and manufactories of corn cob pipes, zithers, flour, shoes, artificial ice, and brewery and foundry products. In the vicinity is an abundance of fire and potter's clay. It was chartered as a city of the third class in 1894. Pop. '90, 2725.

WASHINGTON, a borough in Warren co., N. J.; on branches of the Delaware, Lackawanna, and Western railroad, here connected by a spur with the Central of New Jersey road; 67 miles w. of New York city. It is noted for its manufactories of pianos and organs, silk goods, underwear, and sashes and blinds, and has several public day and night schools, electric lights, waterworks supplied from a mountain reservoir, national bank, and weekly and monthly periodicals. Pop. '90, 2834.

WASHINGTON, town and co. seat of Beaufort co., N. C.; on the Pamlico river and the Atlantic coast line railroad; 128 miles e. of Raleigh. It is accessible from the ocean by vessels drawing 8 feet of water; has a large trade in fish, oysters, cotton, grain, and vegetables; and contains national and state banks, grain elevators, machine shops, lumber and shingle mills, and ice, harness, and barrel and box factories. Pop. '90, 3545.

WASHINGTON, borough and co. seat of Washington co., Pa.; on Chartiers creek and the Baltimore and Ohio, the Pennsylvania Co.'s, the Pittsburg, Cincinnati, Chicago, and St. Louis, and the Waynesboro and Washington railroads; 31 miles s.w. of Pittsburg. It is the seat of Washington and Jefferson college and of the Lemoyne cremation plant; contains a female seminary, Trinity Hall school, public and school libraries, national and private banks, and manufactories of brass, malleable iron, glass, tubes and pipes, carriages, and other articles. The town has natural gas and large bituminous coal interests. Pop. '90, 7063.

WASHINGTON, Mount, "the Crown of New England," as it has been called, is the highest summit of the White Mountains, and with the exception of the peaks of the Black Mountains of North Carolina, is the loftiest mountain east of the Rocky Mountain range. It is situated in Coos co., New Hampshire, in lat. 44° 16′ 25″ n.; long. 71° 16′ 25″ w., about 85 miles n.n.-east of Concord, and is 6285.4 feet above the sea. It descends quite steeply towards the west, but on the east is prolonged into two long spurs, and is cleft by Tuckerman's and Huntington's ravines, and on the north by the extensive gorge called the Great Gulf. The mountain is ascended from the northeast by a wagon road about 8 miles long.; from the southwest by a footpath, and from the west by a steam railroad, opened in 1869, and having a grade of 3596 feet in three miles. The first white man to ascend it, it is believed, was Derby Field, of Portsmouth, in 1642, and the first scientific exploration was that of Rev. Manasseh Cutler (q.v.), of Ipswich, and six others in 1784, who gave it its present name. The sides, for about three-fourths of the distance up, are thickly wooded; then a growth of stunted firs and spruces succeeds, and finally a cone-shaped summit covered with a confused mass of rocks is reached, an almost level area of about an acre at the top, affording room for the United States Signal service observatory, and the summit Hotel (opened in 1873). The summit is covered with clouds much of the time, even in summer, but when an unobstructed view is obtained, the Atlantic ocean may be seen, off Portland, together with parts of five states and the Province of Quebec. It is claimed by mariners that the mountain may be descried twenty miles from land.

The most recent conclusions of geologists are that Mount Washington was wholly submerged during the glacial period. Boulders abound on its sides, and at the summit rocks are found that are common in the town of Randolph to the north. Its summit has the temperature of middle Greenland, at 70° n. latitude, and here grow sedges, rushes, and lichens found only in arctic regions, and plants that bloom exactly at the same times with those in Labrador and Greenland. A small species of snake is occasionally seen on the summit, and midsummer brings to life a rare butterfly, *Klanoba Semidea*, an inhabitant of Labrador and the highest peaks in the Colorado mountains. The range of the thermometer at the summit in midsummer is from 30° to 50°, and the mercury sometimes falls to 20° below the freezing point; while in winter, a temperature of 59° has been recorded. See White Mountains.

WASHINGTON, Bushrod, LL.D., 1762–1829; b. Virginia; son of John Augustine Washington, George Washington's younger brother. From 1780–81 he was a volunteer member of Col. Mercer's troop of horse. After the war he studied law in Philadelphia,

and returned to his native co. to practice. He was a member of the state house of delegates, and of the state convention which ratified the U. S. constitution. In 1798 he became one of the judges of the U. S. supreme court. He inherited Mount Vernon from his uncle.

WASHINGTON, George, commander-in-chief of the continental forces in the war of the American revolution, and first president of the U. S., was b. in Westmoreland co., Va., near the confluence of Bridge's creek and the Potomac river, Feb. 22, 1732, and was the oldest son of Augustine Washington by his second wife, Mary Ball. His remote ancestor was John Washington, who emigrated from England about 1657 with his brother Lawrence. They are believed to have been sons of Lawrence Washington, at one time fellow of Brasenose coll., Oxford, in 1631 proctor of Oxford univ., and afterwards rector of Burleigh, a Royalist; himself the son of Lawrence Washington of Sulgrave, Northamptonshire, and descended from John Washington of Whitfield, Lancashire. John became a landed proprietor and planter in Virginia, in the "Northern neck," a district between the Potomac and Rappahannock rivers, and left two sons, Lawrence and John, the former being the father of Augustine. The little recorded concerning Augustine Washington represents him as a man of high character. By his first wife he had two sons, Lawrence and Augustine; by Mary Ball, who is represented as possessing both intelligence and beauty, four sons and two daughters. Soon after George's birth his father removed to a farm on the Rappahannock river, opposite Fredericksburg, where he d. in 1743. This estate was bequeathed to George; the other children were handsomely provided for, Lawrence receiving what is now called Mount Vernon; and the widow was left a life interest in the property of those by the second marriage. But while the family had a competency and were large landed proprietors, the facilities for education in the colonies—particularly in the south—were at this time so meager that the younger children were forced to depend on the poor common schools of the neighborhood, where they acquired but the veriest rudimentary branches. Such education as he received George completed by the time he was 16 years of age, his last two years of schooling having been devoted mainly to the study of engineering-geometry, trigonometry, and surveying; probably from his having a mathematical turn of mind, and also because the profession promised advantages, in view of the wild state of the country, and the increasing demand for accurate surveys.

His half-brother, Lawrence, was an outside instructor, and Lord Fairfax, cousin of Lawrence's father-in-law, a scholarly man, by his advice and example helped and stimulated the boy. To Lord Fairfax, it is believed, Washington owed the fine literary style he acquired. Though naturally diffident, he saw much society, and that of the best, and at the age of 13 wrote out for his own use 57 maxims of civility and good behavior.

He was athletic in form, given to much exercising, a graceful and expert rider, and fond of the wild life of the woods and encampments. He had the customary boyish proclivity toward imitation of military service, possibly in a marked degree, and appears to have been generally chosen as their leader, and to have been deferred to in the settlement of disputes which arose among them by the companions of his youth. As a growing lad, he was not remarkable as a scholar; was rather reserved and sedate in his demeanor; and was more than is usual among boys of a religious turn of mind. In 1740 his elder brother, Capt. Lawrence Washington, served under Admiral Vernon in the expedition against Carthagena, and named his residence on the Potomac Mount Vernon, in honor of his commander, who offered George a commission as midshipman on his ship, which, but for the opposition of his mother, he would have gladly accepted. In 1748 he received a commission as public surveyor, and the summer months of the next three years were occupied by him in the duties of his profession; more particularly in the region of the Alleghanies, and ranging over the immense tracts of land owned by lord Fairfax. Surveyors were scarce, and the remuneration was ample, and as the young Virginian was economical, he saved money, and acquired property by purchase, long before he reached his majority. This fact, and the qualities of character which he displayed, gained him a solid reputation; and he was thus early regarded with esteem and confidence by the leading men in the province. The year 1751 found the frontiers threatened by the French and Indians, and frequent attacks and depredations occurred, necessitating some provision for the public safety. The colony was accordingly divided into military districts, to each of which an adjutant-general was appointed, with the rank of major, and a salary of £150 per annum. George Washington received one of these appointments, and entered with zeal on the study of the art of war and military tactics and strategy, under experienced provincial officers, among whom was his elder brother, who had seen service on the Spanish main. These studies were varied by an excursion with his half brother (Lawrence Washington) to Barbadoes, whither the latter was sent by his physicians; and who, on his death, soon after, bequeathed to George the estate of Mount Vernon, which had been left to him by his father. The care of this property and his military duties occupied George until 1753, when he was sent as a commissioner, by Gov. Dinwiddie, to gain information concerning the intentions of the French, who had sent an expedition to the headquarters of the Ohio. Washington acquitted himself of this mission very creditably, displaying great judgment, coolness, and address. In the spring of 1754 he was made second in command of the six companies which formed the military establishment of the colony, and with three of these companies, was sent forward to occupy the outposts of the Ohio. This was his first campaign, and he at once distinguished himself by defeating a detachment of the French under De Jumonville;

and, his superior officer dying suddenly, he was raised to the chief command of the detachment. In 1755 Washington became attached to Gen. Braddock's staff and passed through the ill-fated campaign of that year with great *éclat*, his personal bravery under fire becoming thoroughly established; while it was recognized that the fact of his wise counsel not having been listened to had been in no slight measure the cause of Braddock's defeat. The duty now fell to Washington to reorganize the provincial troops, and he retained the command of them until the close of the campaign of 1758, when he resigned his commission, and retired into private life; dissatisfied, as it would appear, with the course of the government in failing to recognize the claims of provincial officers, and in preferring to them the officers of the royal army. On Jan. 6, 1759, Washington married Mrs. Martha Custis, a young widow with two children, wealthy in her own right. The management of her large estate, combined with that of his own, now occupied the most of his time, at least until about 1763. Having been elected to the house of burgesses of Virginia, he now began to appear prominently in public affairs, attending regularly every meeting of the assembly; and though seldom speaking, taking care to be thoroughly informed upon every prominent public question. He moved much in society, also; practised a generous hospitality at Mount Vernon; associated constantly with the leading men of the colony; and soon, and imperceptibly, he had gained a recognized position as a man of profound ability and marked personal influence. At this time he was frequently made the depositary of important trusts, and was very often chosen to act as arbitrator in disputes arising among the colonists. His devotion to business and affairs was untiring; his industry extraordinary. He personally took charge of all his numerous accounts and business records, conducted his large and increasing correspondence, and drafted all his own contracts and deeds. At the outbreak of the revolution he was recognized as the leading man in the colony of Virginia, and was, it is believed, the wealthiest in the colonies. When the dispute between the colonies and England began, Washington held that arms should be the last resort. His respect for lawful authority, and the chances of losing his great estate, made him dread any rupture; nevertheless, he drew up in 1769 a non-importation agreement, which was signed by the state assembly, and at the convention at Williamsburg, Aug. 1, 1773, he was among the foremost in asserting the right of the colonies to self-government. He was one of the six Virginia delegates appointed to the first continental congress, 1774; and in June, 1775, was appointed by that body commander-in-chief of the continental army. For this important position his previous education had exactly adapted him. Not only was he skilled in military affairs; taught by precept and experience the art of war; but his extensive knowledge of the geographical character of the country, and his familiarity with the characteristics and qualifications of the royal army, made him certainly the most dangerous antagonist as a commanding officer, with whom that army could have to cope in the colonies.

Immediately after his appointment Washington left Philadelphia and joined the army at Cambridge, assuming command on July 3, 1775. This army numbered 17,000 men, all told, including the sick. It was in want of everything which could make it an effective fighting force—arms, ammunition, accoutrements; and, worse than all, *esprit de corps*. The course pursued by congress in making its appointments had occasioned much discontent among the general officers; the organization was defective; a commissary and adj.-gen. were more needed than a brave warrior or a skillful tactician. In Washington, fortunately for the country, were combined all three. He proceeded at once to complete an effective organization of his small army, by forming it into six brigades of six regiments each, keeping the troops from each colony, as far as practicable, together, and placing them under a commander from their colony. He sustained a constant correspondence with congress; pressing his views earnestly upon that body, and, though slowly, with marked success. All the officers were commissioned anew by congress, and by degrees a continental army was formed. Washington corresponded with the heads of the different colonial governments, and afterward with the governors of the various states; and by these various means succeeded at length—not only in creating the American army, but in becoming the sole channel of communication between it and the numerous and complicated depositories of authority in the United States. But all this was accomplished amid embarrassments innumerable. The army itself became diminished by the expiration of terms of enlistment; there were cabals among the officers, and disagreements with the civil authorities; yet, despite all opposing influences, the British were held in check during the year 1775, and until a new army could be collected, and arms and ammunition supplied. On March 4, 1776, the Americans took possession of Dorchester Heights, and on the 17th the British evacuated Boston, and their fleet put to sea; whereupon Washington at once proceeded to New York, with the design to prevent a landing. In this he was foiled; partly through the incompetence of his own officers; partly on the account of the royalist strength in New York. The landing was effected, and the Americans were defeated in the battle of Long Island, Aug. 27, 1776; and Washington was forced to abandon New York to its fate, and retreat up the e. bank of the Hudson. He crossed the Hudson, Nov. 12, with only 4,000 men; was hotly pursued through New Jersey by the British; and, when he crossed the Delaware into Pennsylvania, had less than 3,000 weary, half-starved, dispirited soldiers under his command. Three weeks later, with only 2,400 men, he captured more than 1,000 Hessians

at Trenton ; stole away from the superior forces of Cornwallis, defeating his reserve at Princeton ; and by Mar. 1, 1777, not a British or Hessian soldier was to be found in New Jersey, save a remnant at New Brunswick and Amboy. Frederick the Great declared, with regard to the achievements of Washington and his little band of heroes, between Dec. 25, and Jan. 4, following, that they were not excelled in brilliancy by any recorded in the annals of military actions. In the mean time congress had seen the necessity of enlisting a regular army of men for a longer period than a year, which had been its previous judgment ; and it now conferred dictatorial powers on Gen. Washington. The campaign of 1777 opened about the middle of June, and was disastrous to the Americans from the beginning. They were defeated in the battle of the Brandywine, Sept. 11 ; and the British entered Philadelphia two weeks later. On Oct. 4 they were again defeated at Germantown ; and early in December, Washington and his half-clothed and worn-out command made their terrible march to Valley Forge ; where on the 11th they went into winter quarters, in a fortified encampment. During that winter Washington and his troops were subjected to inconceivable privations ; and to add to his embarrassment, a conspiracy among his own general officers had nearly resulted in deposing him from his command ; and was only frustrated by the firmness and good sense of congress, and by the friendly influence of Lafayette and De Kalb, who fully sustained him in this trying moment. Meanwhile, the men suffered for lack of food and proper clothing ; the quartermasters and commissariat departments were deranged and inadequate ; and the patriot cause was at the lowest ebb of its fortunes. But congress took up the question of properly recruiting and providing the army ; a treaty with France was ratified with great rejoicing on the part of the Americans ; and the British, although only 20 m. distant from the American camp, permitted the winter and spring to pass without any offensive movement. All of these circumstances combined enabled Washington to open the campaign of 1778 in somewhat better condition, and with an army in good spirits. Howe evacuated Philadelphia June 18, and Washington crossed the Delaware with his whole army, attacking the enemy at Monmouth, when they retreated, after a sharp engagement. Washington continued his march to the Hudson, which he crossed, and encamped near White Plains. He now distributed his troops in a line of cantonments around New York, extending from Long Island sound to the Delaware ; arranged for the defense of New England ; and in December went into winter quarters. During the whole of 1779 Washington retained his position in the highlands of the Hudson, and remained on the defensive. In 1780 the French government sent out Count Rochambeau, who arrived at Newport, R. I., July 10, with an expedition ; and combined operations were concerted, but not carried out on account of the naval superiority of the British. The features of importance of this year were the capture and execution of Maj. Andre, and the discovery of the treason of Benedict Arnold. The year 1781 found Washington hampered by a vacillating and unreliable congress, doubtful of its own powers, and, although now strongly supported by the French auxiliary army and liberal supplies from France, unable to bring these advantages into full use and application. But in the latter part of September the Americans and French united completely invested Yorktown, Va., where was lord Cornwallis, with the British force. On Oct. 17 the latter proposed a cessation of hostilities ; and two days later he capitulated with his whole army. This concluded the active operations of the war, and the following year was chiefly occupied by Washington in endeavors to heal quarrels among his officers, and to obtain for them from congress the concessions they demanded, and to which they were doubtless rightfully entitled. There is no doubt that had Washington so desired, he could at this time have founded a monarchy, sustained by the bayonets of his army. He took the course, on the contrary, of quelling this disposition on the part of his soldiers, whenever it showed itself. On Nov. 25, 1783, the British evacuated New York ; on Dec. 4 he delivered his farewell address to the army ; and on Dec. 23 he resigned his commission and retired into private life.

During the next five years after the close of Washington's military career, he found sufficient occupation in attending to the affairs of his homestead and property, and in fostering the progress of his native state. Mount Vernon was now constantly the scene of a profuse hospitality, over which Washington presided with the courtly dignity and grace which were natural to him, and which he dispensed with princely generosity. In the convention of 1787, which framed the constitution of the United States, Washington acted as a delegate from Virginia. He was unanimously chosen the first president of the United States, and on April 30, 1789, took the oath of office in New York, where congress was then sitting. Washington's administration of the civil government was marked by the methodical precision which had characterized his conduct through life. His conscientious habit of undertaking no duty until he comprehended its entire scope and bearing, was also specially apparent in his new position. He thoroughly informed himself concerning all affairs of state, and every political act of importance which had been performed by the government and its agents since his retirement. He personally directed the organization of the different departments of the government under the new system, and in accordance with the constitution, and no act of his better showed the solemn seriousness which he attached to the great drama now being performed on the western continent, than his appointment to the offices of heads of these departments of such distinguished and able men as Jefferson, Hamilton, Knox, Randolph, and Jay.

Congress opened in January, 1790; and meanwhile Washington had found time to make a tour through the eastern states, to better acquaint himself with the views of those who were presently to lay the foundation for the commercial and manufacturing supremacy of the United States. Before congress, in his first message, he presented a profound and eminently judicious series of suggestions of laws and provisions, which were at once made the basis of legislation. Not only the skeleton of a new government was now being infused with life and made active and puissant; but the framework of the whole political and social system of the country was being erected. The people were, in the case of their social formation, assimilating; while, in that of their political organization, they were separating into two parties; the same two parties which were henceforth—in different forms, and at times under different names—to sway the course of the empire of the west. The democrats and federals each included the names of many of Washington's closest personal and political friends. Not only on this account, but from the sense of justice which ruled his life, he refrained sedulously from allying himself with either party; and, on the contrary, strove to reconcile the differences between the leaders which he foresaw must inevitably in the future bring about wider differences among the people. The success of his first administration, and the universal sense of a security under his direction which did not appear in the least to be certain under that of any other, produced a general anxiety, as it drew to a close, that Washington should accept the reins of government for a second term. Jefferson and Hamilton—wide apart as the poles in their political opinions, and personally at enmity with each other—agreed in this; and each wrote a letter to Washington urging his compliance with what was now a great popular demand. To their solicitation and those of others he acceded; and on the 4th of March, 1793, took the oath of office for the second time as president of the United States. The very beginning of Washington's second administration saw the United States drawn into the vortex of European politics. The French revolution and the "reign of terror" had culminated in the French republic. Great Britain and France were at war, and gratitude seemed to demand that the western republic should sustain her sister state in the existing struggle. But Washington was especially opposed to foreign complications, and while he accepted the French republic, and received its representative, he steadfastly adhered to his resolution, and the proclamation of neutrality was published April 22, 1793. Now arose factions in the United States, on the one side seeking to enforce practical adherence to the cause of France; on the other, sustaining Washington, though accused bitterly of bias in favor of the ancient enemy of America. Between democrats and federalists the line was now drawn strictly on this basis. Dissensions and resignations occurred in the cabinet; and Jacobin clubs were formed among the people, and were as virulent in the expression of their animosities as were their prototypes in France. In the midst of all the excitement consequent to such a state of affairs, Washington sent John Jay as envoy extraordinary to England, who negotiated the treaty which was signed by Washington on Aug. 18, 1795. The publication of the terms of this treaty aroused the most violent discussion in and out of congress. The latter body called upon the president for the correspondence and instructions involved in the negotiations, and these Washington declined to furnish. Acrimonious debate followed, but the president held firm to his position, and the matter died out. Thus by his wisdom and determination did Washington preserve his country—just emerging from the trials and vicissitudes of the war of independence—from engaging in entangling alliances which would certainly have precipitated renewed warfare, and perhaps have rendered impossible the growth of the magnificent superstructure of which he had laid the solid foundation. On Sept. 15, 1796, Washington published his farewell address to the country he had formed—almost out of chaos. He delivered his last presidential message; a new election resulted in placing John Adams in the presidential seat—though Washington could have been elected for a third term, had not the pressure of his private affairs induced him to decline the honor; and the father of his country retired to his home at Mount Vernon, followed by the love and admiration of a people who now fully recognized his public spirit, his stanch integrity, and the extent of his intellectual resources.

Here he devoted himself to agriculture, but in 1798 the prospect of a war with France led to his appointment as commander-in-chief of the national army. On Dec. 12, 1799, he was exposed in the saddle, for several hours, to cold and snow, and attacked with acute laryngitis, for which he was repeatedly and largely bled, but sunk rapidly, and died, Dec. 14. His last words were characteristic. He said: "I die hard; but I am not afraid to go. I believed from my first attack that I should not survive it. My breath cannot last long." A little later he said: "I feel myself going. I thank you for your attentions; but I pray you to take no more trouble about me. Let me go off quietly. I cannot last long." After some instructions to his secretary about his burial he became easier, felt his own pulse, and died without a struggle.

Europe and even his enemies paid tribute to the memory of Washington; the sermons and addresses in commemoration of his noble life grew into a literature; his name was perpetuated in the names of a multitude of American localities, and his countenance became a perpetual heirloom among his people. It was remarked by Gen. Henry Lee that he was "first in war, first in peace, and first in the hearts of his fellow-citizens."

Washington was 6 ft. 2 in. in height, with brown hair, blue eyes, large head and hands, and strong arms. The portraits painted in his early life are perhaps the most

truthful, as the artificial teeth worn in his later years altered decidedly the expression of his face. The statue by Houdon, at Richmond, has been accepted as the typical likeness, but the forehead is too retreating. The earliest known portrait, by Charles Wilson Peale, was painted in 1772. That by Joseph Wright, painted in 1782, was highly approved by Washington himself. Those by Trumbull and Sharpless are considered faithful in most respects; those by Stuart are somewhat idealized. No one picture can be accepted as entirely satisfactory. Washington was a forcible but not a fluent speaker. He was attentive to his personal appearance, somewhat fond of display, and to a natural diffidence was doubtless due the cold and reserved manner that distinguished him when in public life. Towards young people, and especially towards his nieces and nephews—his adopted children, for he had none of his own—he was gracious and gentle. He inherited from his mother a fiery temper, and sometimes lost control of himself. He was fond of fox hunting, visited the theater occasionally, and was a moderate wine drinker, but was opposed to the use of tobacco, although he raised it for export. He was, like nearly all Americans of property at that period, a slaveholder, but a considerate master, and possessed at his death 124 slaves, whom he directed, in his will, to be emancipated at the death of his wife, so that the negroes of the two estates, who had intermarried, might not be separated. As early as 1786 he expressed himself in favor of abolition by legislative authority. He was not a scholar, and the 1200 or more vols. that composed his library were chiefly on agricultural and military topics. He was a devoted member of the Protestant Episcopal church.

The early biographers of Washington erred in representing him as of almost superhuman excellence, unconsciously discouraging the American youth, before whom he was placed as a model. The criticism of later times deems it but honest to portray the man as he was, and there are writers who are inclined to rate him below some of his generals in military ability, and in political wisdom after Hamilton, Jefferson, and others; but even these echo the tributes paid by the world to his unselfish devotion to duty, especially to the cause of independence, to his courage, his sublime hopefulness under defeat, his strong will, his marvelous insight into character, his abiding faith in God and his absolute integrity and purity of motive. When these virtues are considered, few, if any, heroes of history can be placed beside him.

His wife, who was of the same age, is described as amiable in character and lovely in person. She was the daughter of Col. John Dandridge, of New Kent co., and was born in May, 1732. Her first husband, to whom she was married in June, 1749, was Daniel Parke Custis, a wealthy planter. By the courtesy of the period she was called Lady Washington, and whether in her own happy and hospitable home or at the federal court, she presided with great dignity and grace. She died at Mount Vernon (q.v.), May 22, 1802. See Sparks's *Life and Writings of Washington*, 12 vols., 8vo (Boston, 1834–37); *Life of Washington*, by Chief Justice Marshall, 5 vols., 8vo (Philadelphia, 1805); *Life of Washington*, by Washington Irving, 5 vols., 8vo (N. Y., 1855–59); and the abridged edition (N. Y., 1888); *The Writings of Washington*, collected and edited by W. C. Ford (N. Y., first vol., 1889); the lives by Stoddard (N. Y., 1886); E. E. Hale (N. Y., 1888); and Lodge (2 vols., Boston, 1889); Baker's *Character Portraits of George Washington* (Philadelphia, 1887); Walker's *George, Mary and Martha Washington* (N. Y., 1887); Conkling's *Memories of the Mother and Wife of Washington* (Auburn, N. Y., 1851); Johnston's *Original Portraits of Washington* (Boston, 1882); Baker's *Bibliotheca Washingtonia* (Phila., 1889); the biographies by Ford and Wilson (1896), etc.

WASHINGTON, William Augustine, 1752–1810; b. Virginia; was educated for the ministry, but was appointed a captain in the continental army, and fought in the battles of Long Island, Trenton, and Princeton. He was in command of a troop of light-horse in South Carolina for a time, and distinguished himself by his gallantry at the battle of Cowpens, receiving in recognition thereof a silver medal from congress. During the southern campaign of 1781 he was captured at Eutaw Springs, and was held a prisoner until the war ended. He afterwards settled in Charleston, S. C., and in 1798 was a member of Gen. Washington's staff, with rank as brig.-gen.

WASHINGTON AND LEE UNIVERSITY, at Lexington, Rockbridge co., Va., founded in 1749 as "Augusta Academy"; called in 1776 "Liberty Hall Academy" and chartered in 1782 under that name; in 1798 it took the name of "Washington Academy"; in 1813 its designation was changed to "Washington College," and in 1871 it assumed its present title. In 1798 Gen. Washington gave it 100 shares of stock in the James river canal company, which were converted into an interest-bearing fund of $50,000. In 1802 it received $25,000 from the Cincinnati society; and in 1826, another bequest of $46,500 from John Robinson, a soldier of the Revolution. Its present name is intended to pay equal honor to Gen. Robert E. Lee, who was its president from 1865 until his death in 1870. Gen. G. W. C. Lee succeeded his brother in the presidency, and resigned in Dec., 1896, on account of failing health. The university has no denominational patronage. It has funds amounting to $650,000, and an annual income from endowment of $36,000. Its buildings and grounds are valued at $200,000. In laboratories and apparatus it has a complete outfit, and its extensive museum comprises zoological, mineralogical, and geological cabinets, with an herbarium of 5000 specimens. It has a gymnasium and athletic grounds. The university is divided into thirteen elective

schools, including law, engineering, and the applied sciences. In 1896 it had 18 professors, instructors and lecturers; students, 223. President (from July 1, 1897), William L. Wilson, LL.D.

WASHINGTON MONUMENT, a huge obelisk erected in the city of Washington, having a total height of 555 ft. 5⅛ in. Work was begun in 1858, continuing slowly till 1877, when it ceased, but was resumed in 1878, and finished in 1885. The Washington National Monument soc. originated the plan and controlled the work of construction till 1877, when its property was conveyed to the U. S. The foundation of gneiss had originally a thickness of 23.3 ft., and was 80 ft. square at the base, lessening to 58.6 ft. square at the top. From this the obelisk proper rose, having walls of 15 ft. thickness, with an average facing of 16 in. white marble ; at the base the shaft was 55 ft. 1.5 in. square. It became evident that the foundations were not secure for so lofty a structure, and the great work of strengthening then began in 1878, by which time the obelisk had risen to a height of 156 ft., weighing 22,373 gross tons. Excavations 13.5 ft. deep were made around the base and filled with concrete, thus enlarging the area covered by the foundation from 6,400 to 16,000 ft. The rubble-stone base was partially torn out, and replaced by concrete joined to the concrete foundation ; and the shaft was reduced to 150 ft. The foundation now weighs 36,912 gross tons. The shaft is 34 ft. 5.5 in. square at the top, weighs 43,633 gross tons, and is 500 ft. 5⅛ in. high; the apex, weighing 300 tons, is 55 ft. high, its summit being nearly 600 ft. above the tide-water of the Potomac. The aluminum point which caps the apex is said to be the largest article ever made from that metal. The apex has 262 marble pieces, of seven-inch thickness. Toward the cost of erection the Monument soc. had expended $300,000 ; the total cost has been $1,187,710.31. Lieut. Col. T. L. Casey, of the U. S. engineers, had charge of the work of construction since its passing under the control of the U. S. The original designs were by Robert Mills. The altitudes of some of the highest structures in the world are here given for comparison: St. Paul's, London, 404 ft.; St. Peter's, Rome, 434¾ ft.; Strasbourg cathedral, 495 ft.; Cologne cathedral, 514 ft. The W. M. is 231 ft. higher than the Bartholdi statue.

WASHINGTON UNIVERSITY, founded in St. Louis, under an act of incorporation by the state of Missouri in 1853, comprises several departments, and is intended to embrace the whole range of university studies, except theology, and to afford opportunity of complete preparation for every sphere of practical and scientific life. The charter provides that "no instruction, either sectarian in religion, or partisan in politics, shall be allowed in any department of said university; and no sectarian or party test shall be allowed in the election of professors, teachers, or other officers of said university, or in the admission of scholars thereto, or for any purpose whatever." The university comprehends: 1, the undergraduate department, including the college and the school of engineering; 2, the Henry Shaw school of botany; 3, the St. Louis school of fine arts; 4, the St. Louis law school; 5, the St. Louis medical college; 6, the Missouri dental college; 7, Smith academy; 8, Mary institute; 9, the manual training school. The polytechnic school embraces courses in civil and mechanical engineering, chemistry, and general sciences. The university has large collections in mineralogy and natural history, and intimate connection with the Missouri botanical garden and the Shaw school of botany. The number of professors and other instructors in 1896 was 175; students in all departments, 1823. The total number of graduates from the graduate and undergraduate departments, 3317. Winfield S. Chaplin, LL.D., chancellor.

WASH'ITA, a river of the United States, rises on the western borders of Arkansas, and runs e. and s.e. through Louisiana, emptying into the Red river, 30 m. from its mouth; it is 600 m. long, and navigable to Camden, 300. Its chief branches are the Saline river, La Fourche, Tensas, and Little Missouri. See OUACHITA.

WASH'OE, a co. in n.w. Nevada, having the Truckee river on the s.e. and bordering on California; 5620 sq. m.; pop. '90, 6437. Washoe and Roop cos., Nev., were consolidated (1883) as Washoe co. Co. seat, Reno.

WASHOE SILVER MINES, a rich deposit of siliceous argentiferous galena, discovered in 1859 in a range of hills on the e. side of the Sierra Nevada, on the borders of California and Nevada territory, near the sources of Carson river, 160 m. e. by n. of Sacramento. The ore produces as much as $2000 to the ton, and is largely exported to Europe. The discovery of these mines caused a great excitement in California, and a large emigration.

WASHTENAW, a co. in s.e. Michigan ; produced in one year 906,011 lbs. of wool, 720 sq.m. ; pop. '90, 42,210, chiefly of American birth, inclu. colored. Co. seat, Ann Arbor.

WASP, *Vespa*, a Linnæan genus of insects, now forming the family *vespidæ*, a very numerous and widely distributed family, of the order *hymenoptera* and section *aculeata*. They are distinguished from all the other *hymenoptera* by their wings, when at rest, being folded throughout their entire length. The wings of all the wasps exhibit a similar pattern of nervation, with one marginal and three submarginal cells, and an incom

plete terminal submarginal cell. Their antennæ are usually angled, and somewhat club-shaped at the extremity. The maxillæ are long and compressed; there are glands at the extremity of the labrum; the tongue is trifid, its tips laciniated. The body is naked, or but slightly hairy. The general appearance resembles that of bees; the color is usually black, with yellow markings. The division between the thorax and abdomen is very deep, the abdomen often stalked. The legs are not fitted for collecting pollen, like those of bees. The females and neuters have stings, generally more formidable than those of bees. The larvæ have tubercles instead of feet. The wasps differ very widely in their habits, some being solitary, the family *eumenidæ* of some entomologists; others social, to which the name *vespidæ* is sometimes restricted. Neuters are only found among the social wasps. Some of the solitary wasps make curious burrows in sand, or construct tubes of earthy paste on the sides of walls, in which they form cells for their eggs, at the same time placing there a store of food for the larvæ, some of them using for this purpose perfect insects, others caterpillars, which are stung so as to be rendered incapable of motion without being killed. Others make little earthen cells on the stems of plants, and store in them a little honey for their young. The social wasps have various modes of constructing their nests, which are sometimes formed in excavations in the ground, sometimes attached to walls, boughs of trees, etc., and formed of a paper-like, or sometimes a pasteboard-like substance, produced by mixing into a pulp, with their saliva, small particles of woody fiber, torn by their broad and powerful mandibles from gate-posts, palings, the bark of trees, etc. Great diversities are to be seen in the arrangement of the combs within the nest. The combs are made of a substance similar to the outer covering of the nest, but generally thicker and firmer. As the nest is enlarged, new paper is made for the purpose, the whole nest being inclosed in the last-made envelope, and the inner ones, which sufficed for its former size, are removed to give place to combs. Several inner envelopes are generally found in a wasp's nest, so that paper-making must be a great part of the industry of these insects. The nests of the wasps of tropical countries are often very large, sometimes 6 ft. long, and the communities very numerous. In colder regions the increase of the community and of the nest is arrested by the approach of winter, when the males and the neuters die; but a few of the females survive, passing the winter in a torpid state in some retreat, and found new communities in spring. In a community of wasps there are many perfect females —not a single queen, as in the case of hive bees. Wasps in their perfect state feed very indiscriminately on a great variety of animal and vegetable substances, as insects, flesh, fruit, sugar, etc. Grapes or gooseberries, especially if over-ripe, are often found to contain a wasp in the interior. Wasps often invade bee-hives and steal honey. There is a Brazilian species (*myropetra scutellaris*) which stores up honey like bees. Wasps may be killed by pouring hot water on their nests; but more easily by the vapor of burning sulphur, when the nests are not in the ground; or ether or chloroform may be used to stupify the wasps, so that the nest may be safely destroyed. The largest British species of wasps is the hornet (q.v.), found only in the s. of England. The most abundant species, diffused over all parts of the country, are *vespa vulgaris* and *V. media*. The former is about eight lines long. The front of the head is yellow, with a black center; there are many yellow spots on the thorax, and a yellow band with black points at the posterior margin of each ring of the abdomen; the rest is black. *V. media* is very similar, but rather larger. *V. vulgaris* makes its nest in the ground; *V. media* suspends it generally to the branches of trees, sometimes to the projections of walls. See illus., vol. III.

WASSON, David Atwood, b. Me., 1823; studied at an academy; was a teacher at the age of 19; spent a year in Bowdoin college; went to sea as a common sailor for his health; studied law, but relinquished its practice after a short time; entered the Congregational theological seminary at Bangor, 1849, and completed the course; settled at Groveland, Mass., 1851; changed his theological views, and became a preacher of an independent church there, and, with an interval of six months, remained till 1857; supplied the society of Theodore Parker for a few months, and retired from failure of health; was engaged in the Boston custom-house for four years, and spent two in Germany. He wrote much for reviews. He d. 1887.

WASTE, in the law of real property, is "any act or omission of the tenant of a particular estate, by which the estate of the reversioner or remainder-man is diminished in value." It may be voluntary, where the act of the tenant is willful; or permissive, rising from neglect. The waste may be by a tenant for life or for years as against him who holds the fee, but not by tenant in fee simple against his heir, or by tenant in fee tail against the next donee.

WASTEL. The old English name for a kind of fine white bread or cake.

WASTE LANDS, according to the general use of the term, are uncultivated and unprofitable tracts in populous and cultivated countries. The term waste lands is not employed with reference to land not reduced to cultivation in countries only partially settled. There is a large extent of waste lands even in the British islands. Of the 77,144,000 acres which they contain, only about 58.5 per cent. are arable land and improved pasture; 36 per cent. are occupied with woods and plantations; 25 per cent. of the acreage of Scotland consists of cultivable lands and pasture, while 70.5 per cent. of the sur-

face is taken up by mountains, heath, water, etc. In Ireland, 72 per cent. consists of cultivable lands and pasture. In the United States, the total acreage of farms in 1890 was 632,218,619, an increase of nearly 100,000,000 acres since the previous census. The forest area has been roughly estimated at 500,000,000 acres.

The improvement of waste lands is very much a question of expense. It is often more profitable to improve lands already cultivated, and to bring them into a higher state of cultivation and productiveness, than to reclaim waste lands; in attempting which, much money has often been lost. Much of the cultivated land of America is far from having been brought to the highest state of cultivation of which it is evidently capable, or to a state equal to that of the best cultivated lands of similar soil and situation. In many instances, however, waste lands have recently been improved with great advantage, and it seems probable that no small part of the waste lands of the country are capable of profitable improvement. The process must often be slow and gradual, especially where the soil is naturally very poor, as even the addition of large quantities of manure to very poor soils will not render them fertile, but on the contrary will be followed by a sterility greater than before. The quantity of guano which a rich soil would gratefully receive will destroy every vestige of vegetation on a very poor soil.

The waste lands of Britain are of very various character. Some of them are bogs, already sufficiently noticed in the article Bog. Others are marshes and fens, generally very near the level of the sea, and often within the reach of its tides, chiefly in the eastern counties of England. See Bedford Level. Of these, a great extent has been reclaimed, and has become very productive; much still remaining, however, to be done. There are also extensive moors both in England and in Scotland, often of very poor soil, and often also at such an elevation above the level of the sea as to render profitable agriculture hopeless. This is not the case with all the moors, and it is sometimes possible to effect great improvement by drainage; so that land, formerly almost worthless, may be converted into good pasture. In many places the heath has been extirpated, and the moorland changed into good pasture, and even into good arable land. It is sometimes found very profitable to break up such land, even at very considerable elevations, and afterward to lay it down in pasture, the produce being much greater than it was before. Even in the most elevated tracts, drainage is beneficial; although it must always be considered whether or not drainage will pay. The highest sheep-pastures of the south of Scotland have been greatly improved by a kind of superficial drainage (*sheep-drains*), consisting of mere open channels for water; but in the greater altitudes of the Highlands, and amidst their more rugged steeps, even this is out of the question. In some cases, chiefly of the more level moorlands, much improvement is effected by *paring and burning*, the surface being pared off by the *breast-plough* or *paring-spade*, and burned, generally in heaps, of which the ashes are spread upon the soil. The application of lime is of great benefit in many cases, as is also that of chalk and of marl, but the expense must always be considered, and many tracts of waste lands are so situated that the application of such manures is impossible. Railways have rendered the reclamation of waste lands profitable in many districts in which formerly it would not have been so.—The chalk *downs* of the south of England may, in great part, almost be considered as waste lands, although used for sheep pasture; but they have been found capable of great improvement, although in a slow and gradual manner, by tillage, and the application of manures.—Sands near the sea-shore are fixed by sowing certain grasses (see Ammophila), and are capable of further improvement by cultivation and the application of manures; particularly where the sand is in considerable part calcareous. The most barren and hopeless sands are those which are almost entirely siliceous. Some time ago a company proposed to experiment on a large scale on sand of this kind, by conveying the sewage of London to the Maplin sands on the coast of Essex. Very different opinions were expressed by scientific men as to the probable result of the experiment, which was important both as to the reclamation of wastes and the disposal of sewage. Liebig deemed the siliceous sand incapable of profiting by the rich manure poured upon it. The company commenced their works, but failed to complete them.

WASTING PALSY is one of the terms applied to the disease described in this work under its old name of Tabes Dorsalis.

WATAUGA, a co. in n.w. North Carolina, having the Blue Ridge mountains on the s.e. border; 392 sq.m.; pop. '90, 10,611, chiefly of American birth, with colored. Co. seat, Boone.

WATCH, a small portable machine for measuring time, the construction of which is essentially the same as that of a clock (see Horology), except that the moving power is obtained from the elastic force of a coiled spring instead of from a weight, and the movement regulated, so as to be isochronous, by a balance and balance-spring (q.v.) instead of a pendulum. The going part of a watch consists of a train of wheels and pinions, kept in motion by a spring, called the main-spring; the last and fastest wheel of the train, the scape-wheel or balance-wheel, acting so as to keep in vibratory motion a balance whose movement, again—which is made isochronous by the action of another

spring called the balance-spring—regulates to a uniform rate the revolution of the scape-wheel, and consequently the motion of the rest of the train, and the uncoiling of the main-spring.

The main-spring is a thin ribbon of steel coiled in a barrel. The inner end of it is fixed to a strong spindle, the axis or *arbor* of the barrel, around which it is coiled, and the outer end is fixed to the inside of the barrel. By its tendency to uncoil itself, the spring sets the barrel in motion, and it produces as many revolutions of the barrel as it makes turns itself in unwinding. As its elastic force is greater when it is tightly coiled than when it has to some extent unwound itself, the spring, if its force were applied without modification to the watch train, would act upon it unequally, the power exerted diminishing as the spring uncoiled; so much so, that the watch could not go uniformly throughout the day, though it might keep time from one day to another. A piece of machinery, called a fusee, is employed to correct the variations in the force of the spring, and equalize the power exerted upon the train. The fusee is a cone with a spiral groove, connected with the barrel which contains the main-spring by a chain, one end of which is fixed at the broadest part of the cone, and the other end to the barrel. The barrel moves the fusee by means of the chain, which, as it runs off the sides of the fusee, is coiled upon the outside of the barrel. In winding a watch the key is placed on the axis of the fusee, and by the same movement the main-spring is coiled around its spindle, and the chain wound off the barrel, to cover the cone of the fusee. So when the spring is all coiled up, and its force upon the barrel is greatest, the chain is acting at the small end of the fusee, and its leverage upon the fusee is least; as the force of the spring diminishes, the chain having got to a broader part of the fusee, the leverage is increased; and the grooving of the fusee being, when perfect, arranged so that a section of the fusee along its axis would present two hyperbolas placed back to back, secures that the force of the spring, modified by the leverage of the chain, shall produce a uniform motion of the fusee. From the fusee this motion is communicated to the watch-train, the first wheel of the train—called the fusee-wheel or the great wheel—being set upon the fusee. The use of the fusee is now obsolete, although it was formerly used in almost all old English watches. In modern watches the great wheel forms part of the barrel, and the diminishing power of the main spring as it uncoils is neutralized by the *Escapement*, several forms of which are described below. No very great accuracy in time keeping is possible with the fusee and vertical escapement.

Between the train of wheels and pinions in a watch and that of a clock, until we come to the escapement, there is no difference, except that there is one more wheel and pinion in the watch-train than in the clock-train; the reason of which is, that the scape-wheel of a watch revolves, not like that of a clock, in a minute, but usually in about six seconds, making necessary an additional wheel to revolve in a minute and carry the seconds hand. A great variety of watch escapements are in use. The oldest, which has now gone out of use, is the vertical escapement. It exactly corresponds to the crown-wheel escapement in clocks (see HOROLOGY). The accompanying figure shows a watch-train with this escapement. It may be useful also as indicating, in a general way, the arrangement of the wheel-work in a watch (fig. 1). The main-spring contained in the barrel B, sets in motion the barrel, which, by means of the chain *c*, moves at a uniform rate the fusee F, along with which turns the fusee-wheel W, the first or great wheel of the watch-train. It will be easily seen how, from the great wheel, motion is communicated successively to the center-pinion D, and the center-wheel D′ (which turn in an hour); to the third-wheel pinion, E, and the third wheel, which is upon the same arbor, E′; and to the fourth or contrate-wheel pinion G, and the contrate-wheel G′. The upright teeth of the last named wheel move the balance-wheel pinion H, and with it the balance-wheel or scape-wheel H′, which is fixed upon its arbor. The scape-wheel (and in this escapement the contrate-wheel also) is what is called, from its shape, a crown-wheel. Upon the arbor or verge of the balance K, are two pallets, *p*, *p*, at a distance from each other equal to the diameter of the scape-wheel, and so placed that, as the scape-wheel revolves, its teeth give them alternately an impulse in different directions, which keeps up the vibratory motion of the balance. The balance is made to vibrate isochronously by the action of the balance-spring (q.v.); and its vibration regulates the escape of the teeth of the scape-wheel, and so the motion of the whole train, exactly as that of the pendulum does in an ordinary clock. The vertical escapement is liable, though in a less degree, to the same objection as the old crown-wheel and the crutch or anchor escapements in clocks. There is a recoil of the scape-wheel after one of its teeth has been stopped by a pallet, which interferes more or less with the accuracy and uniformity of the motion of the train. See HOROLOGY.

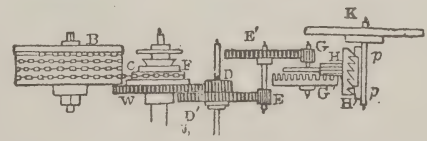


FIG. 1.

Almost immediately after the invention of the balance-spring, attempts began to be made to introduce an escapement which would produce greater accuracy than the

vertical escapement. Hooke, Huygens, Hautefeuille, and Tompion introduced new principles, each of which has since been successfully applied, though they all, from imperfect execution, failed at the time. The first real improvement was made by George Graham, the inventor of the dead escapement in clocks. This is called the horizontal escapement; it was introduced in the beginning of the last century, and it is still the escapement used in most foreign watches. The impulse is given to a hollow cut in the cylindrical axis of the balance, by teeth of a peculiar form projecting from a horizontal crown-wheel. Other forms of escapement in high estimation are the lever escapement, originally invented by Berthoud, improved by Mudge; the duplex escapement, the principle invented by Hooke, the construction perfected by Tyrer; and the detached escapement of Berthoud, improved by Arnold and Earnshaw. The last-mentioned is that which is employed in marine chronometers and in pocket-chronometers, as watches made in all respects like chronometers are called. The lever escapement is that which is used in most English watches. In it the scape-wheel and pallets are exactly the same as in the dead escapement in clocks. See HOROLOGY. The pallets are set on a lever which turns on their arbor; and there is a pin in a small disk on the verge or arbor of the balance, which works into a notch at the end of the lever. The pin and notch are so adjusted, that when a tooth of the scape-wheel has got free, the pin slips out of the notch, and the balance is detached from the lever during the remainder of its swing; whence the name *detached* lever escapement, originally applied to this arrangement. On the balance returning, the pin again enters the notch, moving the lever just enough to send the tooth next in order to escape from the dead face of the pallet on to the impulse face; then the scape-wheel acts upon the lever and balance; the tooth escapes, and another drops upon the dead face of the pallet, the pin at the same time passing out of the notch in the other direction, leaving the balance again free. This arrangement is found to give great accuracy and steadiness of performance. To prevent the teeth from slipping away while the balance is free, the faces of the pallets are slightly undercut, and this makes them secure while at rest; moreover, there is a pin on the lever which moves through a notch on the balance disk, while the pin moves through the notch in the lever, which is so adjusted as to guard against the lever moving and the teeth escaping, while the balance is free.

In watches, even more than in clocks, variations of temperature, unless provided for, produce variations in the rate of going, the increase or diminution of the temperature affecting to some extent the moment of inertia of the balance, and to a great extent the elastic force of the balance-spring. A rise in the temperature makes the balance expand, and therefore augments its moment of inertia; it adds to the length of the spring, and thereby diminishes its elasticity, the elastic force of a spring varying inversely as the length; and the time of vibration of the balance, which depends upon the moment of inertia directly, and upon the elastic force of the spring inversely, is increased—the watch, that is, goes more slowly—in consequence both of the increase of the inertia and of the diminution of the elastic force of the spring. A fall in the temperature is attended by opposite results, the watch going more rapidly than before. A watch without a compensated balance would vary very much more than a clock without a compensation pendulum, but that being usually carried in the waistcoat pocket, it is kept at a pretty uniform temperature. To invent a satisfactory compensation was at one time the great problem for watch-makers. The compensation can obviously be made in either of two ways—by an expedient for shortening the effective length of the balance-spring as the temperature rises, so as to increase the elastic force of the spring; or by an expedient for diminishing the moment of inertia of the balance as the temperature rises, so as to correspond to the diminution of the force of the spring. The first method was that made use of by John Harrison (q.v.), who first succeeded in making a chronometer capable of measuring time accurately in different temperatures; but an adaptation of the other method, invented about eighty years ago by Earnshaw, is that which is always employed now (Fig. 2): *t a t'* is the main bar of the balance, and *t b*, *t' b'* are two compound bars, of which the outer part is of brass and the inner part of steel, carrying weights, *b*, *b'*, which may be screwed on at different places. The brass bar expands more with heat, and contracts more with cold than the steel bar; therefore, as the temperature rises, the bars, with their weights, bend inward, and so the moment of inertia of the balance is diminished; as it falls, they bend outward, and the moment of inertia is increased; and of course the diminution or the increase must be made exactly to correspond to the diminution or increase in the force of the spring.

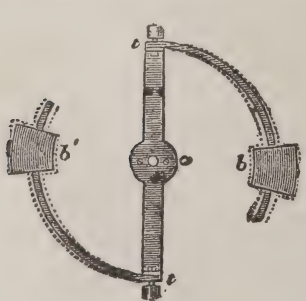


FIG. 2.

The chronometer is just a large watch fitted with all the contrivances which experience has shown to be conducive to accurate time-keeping—e.g., the cylindrical balance-spring, the detached escapement, and the compensation-balance. As a watch which will keep time in one position will often not do so equally well in another, marine

chronometers are always set horizontally in a box in *gimbals* (q.v.), an arrangement which keeps the chronometer horizontal, whatever the motion of the vessel.

The great importance of an accurate time-keeper at sea is for determining the longitude (see LATITUDE). This use was first distinctly pointed out by Sir Isaac Newton. A committee of the house of commons, of whom this philosopher formed one, having been appointed on June 11, 1714, to consider the question of encouragement for the invention of means for finding the longitude, the result of their meetings was a memorial containing an explanation of the different means proper for ascertaining the longitude, and recommending encouragement for the construction of chronometers as the best means of ascertaining it. An act of parliament was then passed, offering a reward for this purpose.

The first chronometer used at sea was invented by John Harrison. After many years of study it was completed in 1736. After several further trials and improvements, and two trial voyages to America, undertaken for the satisfaction of the commissioners, the last of which was completed on Sept. 18, 1764, the reward of £20,000 was finally awarded to Harrison.

Somewhat later than this, several excellent chronometers were produced in France by Berthoud and Le Roy, to the latter of whom was awarded the prize by the académie royale des sciences. Progress was still made in England by Arnold, Earnshaw (the inventor of the compensation still in use), and Mudge, to whom prizes were awarded by the board of longitude, and under whom a perfection nearly equal to that of the present day was obtained. The subsequent progress of watch-making has been chiefly directed to the construction of pocket-watches on the principle of marine chronometers, or to the combination of accuracy with convenient portability. The adjusted lever watch is now made in Clerkenwell with a degree of accuracy which enables the performance to be warranted within an error of one second a day.

While the compensation of a chronometer can never be made perfectly accurate for all degrees of temperature, there are always two temperatures at which a well-constructed chronometer will go with perfect accuracy. The explanation of this lies in the fact that while the variations of elastic force in the spring go on uniformly in proportion to the rise or fall of the temperature, the inertia of the balance cannot be made to vary as it should do, in exact correspondence to them inversely. The variation of the elastic force may be represented by a straight line inclined at some angle to a straight line divided into degrees of temperature; the corresponding changes of the moment of inertia will be represented by a curve, and this curve can coincide with the straight line representing the variations of elastic force only at two points, corresponding to two different temperatures. The particular points in the case of any chronometer are matter of adjustment. For instance, one chronometer may be made to go accurately in a temperature of 40°, and also in a temperature of 80°, at other temperatures being not so accurate; another chronometer to go accurately at a temperature of 20° and of 60°. It is manifest that the former would be adapted to voyages in a warmer, the latter to voyages in a colder climate. Apparatus for testing chronometers have been long in use in the observatories at Greenwich and Liverpool. In the latter, there is now an extensive apparatus for this purpose, devised by the ingenious astronomer, Mr. Hartnup, In a room which is isolated from noise and changes of temperature, the chronometers are arranged on a frame under a glass case, so contrived that they may be subjected in turn to any given degree of temperature. The rate of each under the different temperatures is observed and noted, and the chronometers registered accordingly. These observations are of the greatest importance both to ship-captains and instrument-makers, who can have their instruments subjected to the observations on payment of a fee.

It may be stated that the main-spring had been employed as the moving force of time-keepers for about a century before the invention of the balance-spring; but very little is known about the action of these forerunners of the watch. A watch without a balance-spring must have been a very rude and untrustworthy contrivance. The honor of first proposing the balance-spring is undoubtedly due to Dr. Hooke, though Huygens and De Hautefeuille also invented it independently much about the same time.—See Denison's *Rudimentary Treatise on Clocks and Watches;* Wood's *Curiosities of Clocks and Watches;* Benson's *Time and Time-tellers* (1875). See WATCHMAKING, etc.

WATCH, on shipboard, a division of the crew into two, or if it be a large crew, into three sections; that one set of men may have charge of the vessel while the others rest. The day and night are divided into watches of four hours each, except the period from 4 to 8 P.M., which is divided into two *dog-watches* of two hours' duration each. The object of the dog-watches is to prevent the same men being always on duty at the same hours.

WATCH HILL, the extreme S.W. limit of the state of Rhode Island, in the t. of Westerly; containing several large hotels and a light-house, built of granite, 40 ft. high, showing a fixed white light 60¾ ft. above the sea. It is a popular summer resort.

WATCHING AND WARDING, in Scotch law, mean the services rendered by one who holds lands under burgage tenure. These services are merely nominal.

WATCHMAKING BY MACHINERY. The idea of making watches by machinery upon a uniform system first occurred to Aaron L. Dennison, a Boston watch-maker, in 1848. His original plan was to gather together under one roof several little labor-saving machines which were used in Switzerland for some of the processes of watchmaking, to supplement these by new contrivances, and to run them all by one power. He thought that in this way he might be able to turn out ten watches a day. The scheme was considered wild and impracticable. However, he managed to form a small company, which built a factory at Roxbury, Mass. But the Swiss authorities passed a law prohibiting the exportation of machines, models, or drawings, so that the pioneer company was obliged to construct its own machines, with which the first machine-made watch was turned out, 1853. Subsequently the works were removed to Waltham, Mass., and here the American Watch company was incorporated. This company has been very successful. Its buildings cover nearly five acres of ground, and it turns out in the neighborhood of 7,000,000 watch movements annually. Great improvements, many of recent date, have been made in the machinery. Since 1878 the cost of producing a movement has been reduced one half, and the share which mechanism has in the finished watch has been increased, so that now, beyond collocation, nothing remains for handwork, save the preparation of the jewels, done in a hand-lathe, and the cutting of gold regulating screws for high-grade balances. Watchmaking by machinery necessitates a great number of operations, many of which must be repeated several times. In making the movements of some of the Waltham stem-winding watches nearly 4000 distinct mechanical operations are required, and in the fabrication of any movement at least from 600 to 800 processes are employed. Exclusive of the manufactories of cheap and inferior watches with which the markets are flooded, there are in the U. S. a number of manufacturers of high-grade movements. among which are the Elgin National Watch Co., the Waterbury Watch Co., and the New York Standard Watch Co. The first-class machine-made watch has now a high rank as an accurate and trustworthy time-keeper, and possesses a great advantage, inasmuch as its parts are interchangeable; *i.e.*, the parts of all watches of a certain number or kind are turned out identical in size, so that a broken or worn-out part can be easily replaced, and the owner need only send on the number of his watch to enable the factory to send him a duplicate of the part. Outside of the U. S. comparatively few watches are made by machinery ; in Switzerland this American idea is gaining ground, and factories for making watches by machinery are increasing ; while England, whose manufacturers have been almost driven from the market by the cheapness and excellence of the American machine-made watch, is slowly awakening to the fact that she must adopt the American methods in order to compete successfully in the watch trade with American manufacturers.

WATCH, NON-MAGNETIC. A watch whose quick-moving parts—viz., escapement, balance, and balance spring are made from non-magnetic metals invented in 1884 by C. A. Paillard, a Genevese horologist. The compensation balance and balance spring are made from Paillard steel, a metal produced by carbonizing an alloy of palladium, copper, silver, and steel, remaining parts of escapement, from alloys of gold, aluminum, or aluminum bronze.

The steel escapements of ordinary watches become magnetized when introduced into magnetic fields, such as exist about dynamos and electric-motors. The balance becomes a compass, the poles tending to point n. and s., and are also attracted and repelled by the surrounding magnetized steel pieces of the watch. By such attraction and repulsion the regular oscillation of the balance is interfered with, and the watch ceases to keep correct time. The variation in magnetized watches varies from a few seconds to several hours per day. When heavily magnetized the watch stops. The introduction of electric-motors on street railways renders non-magnetic watches practically a necessity.

WATCH-RATES, in England, are the rates authorized to be levied in a parish or borough for the purpose of watching and lighting.

WATELET, Claude Henri, 1718–86 ; b. Paris ; French writer on art and amateur artist. A number of portraits and other pieces were etched by him, but his reputation rests rather upon his books, *Essay on Gardens* (1774) and *Dictionary of the Arts of Painting, Sculpture, and Engraving.* The last-named work was completed by Levesque, and was issued in 5 vols. in 1792. Another, but less meritorious publication, was *The Art of Painting* (1760), in which he strove to instruct through the medium of verse. He was a contributor to Diderot's *Encyclopédie,* and was admitted to the French academy.

WATER. The ancients considered matter to be composed of four elements : Earth, Air, Fire, and Water, in varying proportion, Water imparting the properties of coldness and wetness. This view was slightly modified about the beginning of the 16th century, somewhat more early in the 17th by Van Helmont, but it remained for Lavoisier near the close of the 18th century to explain the composition of air and water and put chemistry upon its present basis. Cavendish definitely determined the volumetric composition of water, but explained the facts in accordance with the dying theory of phlogiston. The relative merits of Cavendish, James Watt, and Lavoisier are thus stated by Kopp (from Roscoe): "Cavendish first ascertained the facts upon which the discovery of the composition of water was based, although we are unable to prove that he first deduced

from these facts the compound nature of water, or that he was the first rightly to recognize its constituent component parts. Watt was the first to argue from these facts the compound nature of water, although he did not arrive at a satisfactory conclusion respecting the nature of the components. Lavoisier, also from these facts, first clearly recognized the compound nature of water, and determined exactly the amount of its components."

The chemical formula for water was until about the middle of the present century generally written HO, and indeed is by some chemists so written at the present time. This formula belongs to a system that indicates proportional composition in the simplest manner, 1 part of hydrogen to 8 parts of oxygen, without reference to atomic weights or vapor densities. The modified formula, H_2O, while necessarily expressing the same proportional composition in accordance with experimental facts, is based on evidence that oxygen takes part in chemical changes in proportions of 16 rather than 8, and also upon the principle that substances which are gaseous or which can be changed to vapors without decomposition shall receive a formula indicating a total weight equal to twice their vapor density when stated in terms of hydrogen. Water vapor is 9 times as heavy as hydrogen; the formula of water should therefore indicate a weight of 18, and H_2O does this for $H_2=2, O=16, 2+16=18$. H_2O also accords with the decomposition of water vapor into two volumes of hydrogen for every one volume of oxygen.

Water occurs abundantly in nature in three familiar forms—vapor, liquid, and solid. It is a constituent of all animals and vegetables. About 66 per cent. of man, 75 per cent. of fishes, and 90 per cent. of fresh vegetables is water. It is a plentiful component of many minerals which are apparently dry; for instance, gypsum is about $\frac{1}{5}$ water. It forms part of a large number of crystalline salts; $\frac{36}{249}$ of copper sulphate, or blue vitriol, is water, while almost exactly half of crystallized borax is the same.

Water is the product of many chemical changes; among the more prominent of these may be mentioned the oxidation of hydrogen and all its compounds, e.g., the burning of marsh gas ($CH_4+2O_2=CO_2+2H_2O$); the combination of acids and bases, e.g., sulphuric acid and slaked lime ($H_2SO_4+Ca[OH]_2=CaSO_4+2H_2O$); the action of hydrogen on hot oxides, e.g., iron oxide ($Fe_2O_3+3H_2=2Fe+3H_2O$); and the decomposition under the influence of heat of a majority of those organic compounds which contain both oxygen and hydrogen, e.g., oxalic acid, sugars and starches, fibrin, albumen, etc.

Water (H_2O) is at normal pressure and between 32° and 212° F. (0° and 100° C.) a liquid transparent, nearly colorless, neutral in reaction and without taste. It has, to man, a faint indescribable odor which is doubtless perceptible to animals at considerable distances. When seen in large quantities, or through long tubes, it has a blue tinge. Its specific gravity is 1., and it forms the standard of comparison for all solids and liquids. It is 825 times as heavy as air. In the form of vapor, it is 9 times as heavy as hydrogen and its molecular weight is 18. A cubic foot of water at its maximum density weighs 997 oz., and a gallon weighs 70,000 grains. See Avoirdupois, Gallon. A cubic centimetre weighs 1 gramme, and a litre weighs 1000 grammes or 1 kilogramme. See Metric System. Water is only slightly compressible, each atmosphere of added pressure diminishing its bulk fifty-one millionths; a pressure of 30,000 lbs. will reduce 14 volumes to 13. It is a poor conductor of heat and of electricity. It has, however, the greatest capacity for heat of any substance (hydrogen excepted), and is taken as the standard of specific heats. See Heat. If 1.000 heat unit is required to raise the temperature of 1 gramme of water 1 degree Centigrade, it is found that .0319 heat units will raise 1 gramme of Mercury 1 degree, so the specific heat of Mercury is called .0319.

The effects of heat upon water are stated thus in Jago's *Morganic Chemistry:* "Among the properties of water, the physical changes it undergoes as a result of the application of heat are of such importance as to warrant a somewhat extended description. As is well known, at a temperature below the freezing point water exists in the solid state and is known as ice. Taking a piece of ice at a temperature much below that at which it was formed, say, 20° C., the following is a history of its changes as a result of the continuous application of heat: As heat is first applied, the ice rises in temperature and at the same time increases in volume (expands); these changes proceed regularly until a temperature of 0° C. is attained. At that point the temperature remains stationary, notwithstanding that the absorption of heat continues. During this time the ice melts, and the heat thus absorbed, without causing any corresponding elevation of temperature, is employed in doing the work of converting the solid ice into liquid water. The heat necessary to melt a given weight of ice at 0° C. into water at the same temperature would raise the same weight of water from 0° to 79° C.; a fact which is expressed in other words, by saying that the latent heat of water is 79 heat-Units. During the melting of ice a considerable diminution in volume occurs, 10 volumes of water only being produced from 10.9 volumes of ice. As soon as the whole of the ice is melted, the temperature once more commences to rise, and does so steadily until a temperature of 100° C. is attained. The water at 0° C. diminishes in volume with an increase in temperature, until at 4° C., when it commences to expand, and continues to do so until 100° C. is reached. At 4° C., therefore, water is at its maximum density; either an increase or diminution of temperature results in expansion. At 100° C. the water commences to boil and remains stationary in temperature, but is not all at once converted into vapor;

on the contrary, between five and six times as long is necessary to boil away the whole of the water as was requisite in order to raise it from the freezing to the boiling point. In exact figures the quantity of heat necessary to convert a given weight of water into steam is sufficient to raise 537.2 times the weight of water from 0° to 1° C. The steam produced is at the same temperature, 100° C., as the boiling water; the large amount of heat is employed in the conversion of water from the liquid to the gaseous state. The whole of the water having been converted into steam, a further application of heat results in the expansion of the steam, which follows the general laws governing the relation of gases to heat.

"In cooling, steam passes through a series of changes which are just the reverse to those it experiences on being heated. During the condensation of steam into water and the solidification of water to form ice, heat is liberated in the same quantity as was required in the first place to effect respectively the liquefaction of ice and the conversion of water into steam."

It has been stated above that water has its maximum density at 4° C. (39.2° F.). The effect of this peculiarity is explained by Roscoe, as follows: "Although the amount of contraction on heating from 0° to 4° is but small, yet it exerts a most important influence upon the economy of nature. If it were not for this apparently unimportant property, our climate would be perfectly Arctic, and Europe would in all probability be as uninhabitable as Melville Island. In order better to understand what the state of things would be if water obeyed the ordinary laws of expansion by heat, we may perform the following experiment, first made by Dr. Hope: Take a jar containing water at a temperature above 4°, place one thermometer at the top and another at the bottom of the liquid. Now bring the jar into a place where the temperature is below the freezing point, and observe the temperature at the top and bottom of the liquid as it cools. It will be seen that at first the upper thermometer always indicates a higher temperature than the lower one; after a short time both thermometers mark 4°; and, as the water cools still further, it will be seen that the thermometer at the top always indicates a lower temperature than that shown by the one at the bottom; hence we conclude that the water above or below 4° is lighter than water at 4°. This cooling goes on till the temperature of the top layer of water sinks to 0°, after which a crust of ice is formed; and if the mass of the water be sufficiently large, the temperature of the water at the bottom is never reduced below 4°. In nature precisely the same phenomenon occurs in the freezing of lakes and rivers; the surface water is gradually cooled by cold winds, and, thus becoming heavier, sinks, whilst lighter and warmer water rises to supply its place; this goes on till the temperature of the whole mass is reduced to 4°, after which the surface water never sinks, however much it be cooled, as it is always lighter than the deeper water at 4°. Hence ice is formed only at the top, the mass of water retaining the temperature of 4°. Had water become heavier as it cooled down to the freezing point, a continual circulation would be kept up, until the whole mass was cooled to 0°, when solidification of the whole would ensue. Thus our lakes and rivers would be converted into solid masses of ice, which the summer's warmth would be quite insufficient thoroughly to melt; and hence the climate of our now temperate zone might approach in severity that of the Arctic regions.

"Sea water does not freeze *en masse*, owing to the great depth of the ocean, which prevents the whole from ever being cooled down to the freezing point; similarly, in England, very deep lakes never freeze as the temperature of the whole mass never gets reduced to 4° C."

The expansion of water at the time of freezing is evidenced by the bursting of water pipes and vessels and disintegration of wet bricks after freezing and of natural rocks.

The melting point of ice is 0° C. (32° F). This is commonly the freezing point of water, but various conditions may cause it to remain liquid at a much lower temperature. "In closed vessels, at perfect rest, and *out of contact with air*, the temperature of water may be lowered to 14° F. (—10 C.) without solidification, but if the water at this temperature be shaken, it instantly freezes, the temperature immediately rising to 32° F. (0° C.). In closed vessels, *air being present*, or in very narrow tubes, water may be cooled to 5° F. (—15 C.) without freezing, solidification occurring on the slightest motion being imparted to the liquid. If water be surrounded by certain mixtures (such as chloroform and sweet almond oil, which may be mixed in such proportions that the liquid has the same density as water) the water thus encircled may be cooled, without solidifying, to —4° F. (—20° C.). If in this state, however, it be touched with a piece of ice, it instantly freezes and expands. The melting point is lowered .0075 C. for every additional atmosphere. At a pressure, therefore, of 13,000 atmospheres, ice would be converted into water at 4° F. (—18° C.). Water at 39.2° F. (4° C.) enclosed in a perfectly tight vessel where expansion is impossible, will not freeze although cooled below zero." Pidy's *Handbook of Modern Chemistry*. See Fusing and Freezing Points.

Ice, snow, and frost are forms of frozen water. The crystals are six-sided or star-shaped (hexagonal system). They may often be seen in great beauty and variety at the beginning of a snow storm. The Sp. Gr. of ice is .91662. See Ice.

Water evaporates at all temperatures. Even ice and snow evaporate without perceptibly melting. When water is heated at the point when its vapor tension balances

the atmospheric pressure, bubbles of steam begin to escape and the water is said to boil. This takes place at sea level and 76° mm. pressure of the barometer at 212° F. (100° C.), but is evidently variable with pressure and elevation. See Boiling. One volume of water becomes 1696 of steam.

Water is a solvent of the widest range and application. On this account natural waters are never pure, but hold in solution solids and gases. See Water Supply. Distilled water is obtained by condensing the steam from boiling water. The earlier portions of the distillate contain ammonia and other gases from the water, but if suitable water was used for distillation the portions obtained after rejecting the earlier portions are reasonably pure. Such a process does not free water from many liquids which boil at nearly the same point or which are carried over in its vapor. Distilled water from water containing alcohol or glycerin or hydrochloric acid would constantly contain those substances.

Water is applied as a solvent of solids, liquids, and gases. Any complete discussion of solution would require a consideration of a great many special cases. It takes place in the case of solids for the most part without marked evidence of chemical change. The solid is recoverable upon evaporation of the water. There are, however, a great variety of compounds known as *solution compounds* which exist only in water and which are decomposed upon evaporation of the water (e.g., see *Chemical News*, Apr. 10, 1890. Many compounds called *cryohydrates* have been separated in which the water at low temperatures combines in definite proportions with usually anhydrous compounds, or combines in proportions different from the usual proportions. Many facts concerning *cryohydrates* may be found in Cornelley's *Tables*.

Gases usually dissolve with an elevation of the temperature of the liquid, and in greater quantity in cold than in hot water ; water at 0° C. (32° F.) will dissolve 1148 times its volume of ammonia, at 15° C. (59° F.), 782 volumes, and all the ammonia leaves the water after boiling some time. Many gases, not very soluble in water, dissolve in direct proportion to the pressure—twice as much at two atmospheres as at one.

Solids usually dissolve with a lowering of temperature. They dissolve more rapidly with agitation, fine division, application of heat, situation at the top rather than the bottom of the liquid. Most solids dissolve in greater proportion in hot water than in cold. There are exceptions to this statement ; and some dissolve only a little more, others with an enormous increment in the hot solvent. The solid dissolves in all proportions in water up to a certain limit, at which no more will dissolve ; the solution is saturated. The limit of solubility is different with every variation of temperature (usually), so that cooling a solution saturated at any temperature, generally makes necessary the deposition of a portion of the solid ; evaporation has a similar effect by removing a part of the water. When the cooling or evaporation takes place slowly the solid may be deposited in regular forms known as crystals. These methods are practical on a large scale.

Solutions of salts have a higher boiling point than water and a lower freezing point. For instance, a saturated solution of calcic chloride boils at 179.5° C. (355° F.). Sea water freezes at about 29° F. Solids in solution are largely deposited when the solvent freezes.

A great variety of chemical changes and decompositions are conveniently effected in water solution ; the fine division and intimate mixture desirable being easily obtained in this way.

Water is an oxide of great stability ; when the combination of hydrogen and oxygen takes place to form water a great deal of heat is disengaged—more than from corresponding weights of any other substances. It is, however, subject to decomposition in various ways. The electric current from 2 or 3 Bunsen cells passed through acidulated water decomposes it into its constituent gases ; great heat accomplishes the same result ; a number of metals (sodium and potassium) at ordinary temperatures displace half its hydrogen, and, when heated, the whole ; hot iron removes its oxygen, setting all the hydrogen free ; a jet of steam driven upon white hot coal is decomposed, the oxygen combining with the carbon of the coal. Great labor has been expended to determine the exact ratio between the constituents of water ; this work cannot be considered as completed at the present time. When water is decomposed by electricity, two volumes of hydrogen are obtained to one of oxygen ; this ratio is not exact, because part of the oxygen is liberated in a condensed form—as ozone, and because the oxygen is much more soluble in water than hydrogen. The oxygen is, therefore, a little less than half the volume of the hydrogen. If, however, one volume of pure oxygen and two volumes of pure hydrogen are exploded in an enclosed space—a rudimetre—the exact combination is shown. The product, if all through the experiment a temperature as high as the boiling point of water is maintained, is, from the three volumes, two volumes of water vapor ; if, however, the water condenses to the liquid condition it is not measurable. Two volumes of hydrogen and one volume of oxygen give two volumes of water vapor. The weight relations are determined as follows : Pure hydrogen is passed in constant current over heated oxide of copper from which the hydrogen takes oxygen and forms water ; the water is collected and weighed ; the loss of weight in the copper oxide gives the oxygen, the difference between the water and oxygen gives hydrogen. Extraordinary precautions are taken to secure purity of hydrogen and copper oxide and to collect all the water. A recent modification of this classical experiment has been to

obtain the weight of hydrogen directly. Palladium is a metal which "occludes," or alloys with, a large quanity of hydrogen, which is released by heat. So that in this modification the hydrogen is obtained from the loss of weight of the hydrogen-palladium alloy; the oxygen and water are weighed as before. This has not seemed to add anything to the accuracy of results. Water consists of 88.864 per cent. oxygen, 11.14 hydrogen, according to the best experiments. This, as ordinarily stated, is in the ratio of 16 to 2.

Water enters into definite chemical union with many oxides. The products are of two very different classes. If the trioxide of sulphur (SO_3) be brought in contact with water an immediate union takes place with the evolution of much heat, and the product is the well-known compound, sulphuric acid (H_2SO_4). SO_3 is often called the *anhydride* of sulphuric acid, because it represents that acid without its water. It is not, however, supposed that the H_2O exists as water in the H_2SO_4, but that the whole forms a single stable compound. If the oxide of lime (C_aO) is treated with water again, heat is disengaged and there is produced a solid, only sparingly soluble in water, called calcium (or lime) hydroxide ($C_aO_2H_2$). This is chemically directly the opposite of the acid, and is called a base, alkali, or hydroxide. In this particular case the water may be again separated by heat, but in other similar cases it cannot. The union with water to form compounds of an acid nature is rather characteristic of oxides of the non-metallic elements, though some of the higher metallic oxides have this property or tendency; while the union with water to form compounds of a basic, or acid-neutralizing nature is more characteristic of metallic oxides.

Water also forms a part of a great many crystalline salts. It combines with them in exact proportions and seems to be essential to some of the properties of the salt—its cohesion, its color, its crystalline structure. Many crystals contain no *water of crystallization.* Some which contain it, part with it easily in only moderately dry air, and crumble to powder. They are said to effloresce, e.g., common washing soda (Na_2SO_4, $10H_2O$). Others part with all their water of crystallization when heated to 100° C. (212° F). Others still retain a certain definite proportion to a much higher temperature than that at which the greater part can be driven off. This more firmly held water is often called *water of constitution.* Many salts melt in their own water of crystallization when slightly heated. Water of crystallization is indicated by Aq or H_2O in a formula ($CuSO_4,5H_2O$ or $CuSO_4,5Aq$). The difference between water of crystallization and water of constitution is by some writers indicated by Aq for the former, and H_2O for the latter ($CuSO_4,H_2O,4Aq$). Of course the amount of water is an important consideration in calculations involving the weight of crystalline salts.

Sea Water.—Since the publication of Forchhammer's extensive researches in 1865, our knowledge of the ocean has been much extended by the North Sea Expedition, the study of the German ocean and the Challenger Expedition with its elaborate reports. Sea Water is a complex solution of various salts which are nearly constant in their relation to one another, though varying perceptibly in relation to the water in which they are dissolved. The approximate specific gravity is 1.026—1.028 (see *infra*), and the salts are in the proportion of about 3.5 to 96.5 of water. The following table by Dittmar represents the results of a large number of analyses:

Chloride of Sodium, 77.758; Chloride of Magnesium, 10.878; Sulphate of Magnesium, 4.737; Sulphate of Lime, 3.600; Sulphate of Potash, 2.465; Bromide of Magnesium, .217; Carbonate of Lime, .345; Total, 100.000. These salts represent the probable, though not certain, combination of the acids and bases found in analysis. There are a large number of other elements in small, and some in extremely minute proportion. Thus there have been found silicon, boron, iodin, fluorin, phosphomo, nitrogen, silver, copper, lead, zinc, cobalt, nickel, manganese, aluminum, strontium, barium, iron, arsenic, gold, lithium, rubidium, cæsium, in addition to the elements given as salts in Dittmar's table. In computing the results of analyses of sea water, Forchhammer computed the relation of each constituent, and of all the salts, to Chlorin, taken as 100; and this method of comparison has been followed by other chemists, substituting, however, for chlorin, halogens computed as chlorine. According to Dittmar's averages the total salts are in the ratio of 180.58 to every 100 of halogens (bromin, which is very small, being computed as chlorin).

The relation of the various constituents to each other is nearly constant, with two exceptions—lime and carbonic acid. The quantity of lime increases with the depth very slightly, though measurably; and the explanation is suggested that the forms of life that manufacture carbonate of lime shells have their habitat near the surface, but sink to the deep sea after death and thus become a source of lime in the deep water. It also appears from many analyses of the bottom obtained in the voyage of *The Challenger* that in the majority of analyses a large percentage was carbonate of lime.

The carbonic acid has been elaborately discussed by Pornöe, Buchanan, and Dittmar. It consists of the Co_2 in normal carbonate (of lime), of "loose carbonic acid," and, in a few exceptional cases, of free carbonic acid. From Dittmar's analyses the normal range of Co_2 from normal carbonate is from .14 to .16 per 100. of total solids, with more in deep than in surface waters; and the conclusion of the discussion of loose carbonic acid may be stated in his own words: "(1) Carbonic acid rarely occurs in the free state; as a rule, it falls short of the quantity which would produce bicarbonate. (2) In

surface waters it is relatively high where the natural temperature is relatively low, and *vice versa*. (3) Within ranges of equal temperature it seems to be less in the surface water of the Pacific than it is in that of the Atlantic ocean. Of the 195 samples of sea water which Buchanan analyzed for carbonic acid only 22 contained fully saturated bicarbonate, and only 2 out of these free carbonic acid in addition to bicarbonate."

The oxygen and nitrogen of sea water are absorbed from the atmosphere, and analyses of surface water agree fairly with the calculated amount to be expected at the given pressure and temperature. The oxygen is, however, subject to constant diminution through processes of oxidation. None of the deep sea waters from the Challenger expedition were found entirely free of oxygen.

The salinity of the water is subject to considerable variation—salinity being the ratio of salts to the weight of the whole water. The method employed consists in taking the specific gravity of the water and computing from this. The formation or melting of ice, the rain, and the inflowing of rivers are the chief causes affecting the salinity. In the Atlantic the maximum is 1.0285, and the minimum 1.0255; in the Pacific, which is much less known, it ranges between 1.02719 and 1.0255 pure water=1.000.

The temperature, on the whole, decreased towards the bottom, steadily reaching a general minimum of about 2° C., occasionally going a fraction of a degree and even 2° below the zero point. It is largely influenced by currents and barriers.

WATER-BED, called also the Hydrostatic Bed, or Floating Mattress. It is well known that the life and health of every part of the animal body depend on the sufficient circulation through them of refreshed blood. See Circulation. Now, when a person in health is sitting or lying, the parts of the flesh compressed by the weight of the body do not receive the blood so copiously as at other times; and if from any cause the action of the heart has become weak, the interruption will follow both more quickly and be more complete. A peculiar uneasiness soon arises where the circulation is thus obstructed, impelling to change of position; and the change is made as regularly and with as little reflection as the winking of the eyes to wipe and moisten the eyeballs. A person weakened by disease, however, while generally feeling the uneasiness sooner, as explained above, and becoming restless, makes the changes with increasing fatigue; and should the sensations become indistinct, as in the delirium of fever, in palsy, etc., or should the patient have become too weak to obey the sensation, the compressed parts are kept so long without their natural supply of blood that they lose their vitality, and become what are called sloughs or mortified parts. These, if the patient survives, have afterward to be thrown off by the process of ulceration, leaving deep hollows to be filled up by new flesh during a tedious convalescence.

It was to mitigate all, and entirely to prevent most of the evils attendant on the necessity of remaining long in a recumbent posture, that the hydrostatic bed was devised by Dr. Neil Arnott, late one of the queen's physicians. The bed may be shortly described as a mattress floating on water, with a loose sheet of caoutchouc cloth properly secured between it and the water, to prevent its being wetted. A person rests on it as a water-fowl does on its bulky feathers, with as little inequality of local pressure as if in a bath. A trough of the dimensions of a wide sofa or a bed, having 6 or 7 in. depth of water in it, with the required caoutchouc covering, is the foundation, on which clothes and pillows are laid as in a common bed.

WATERBRASH. See Pyrosis.

WATER-BUDGET, a heraldic bearing in the form of a yoke, with two pouches of leather appended to it, originally intended to represent the bags used by the crusaders to convey water across the desert, which were slung on a pole, and carried across the shoulders. The Trusbuts, barons of Wartre in Holderness, bore *Trois boutz d'eau*, three water-budgets, symbolizing at once their family name and baronial estate.

WATER-BUG, the popular name of a tribe or section of heteropterous insects, *hydrocorisæ*, which live almost entirely in water, and feed upon other aquatic insects. The anterior portion of the first pair of wings is horny; the antennæ are very small, and concealed beneath the eyes. The *hydrocorisæ* are divided into two families, *notonectidæ* and *nepidæ*. Of the former, the boat-fly (q.v.) is an example. The *nepidæ* are popularly known as Water-Scorpions.

WATERBURY, city and co. seat of New Haven co., Conn.; on the Naugatuck and Mad rivers, and several smaller streams that here unite, and on the New England and the New York, New Haven, and Hartford railroads; 30 m. n. of New Haven. The site was called Mattatuck by the Indians; the white settlement originally formed a part of Farmington, and was incorporated as a town in 1686, and the town received a city charter in 1853. The city is surrounded on three sides by hills. A handsome public park, containing a soldiers' monument and a costly drinking-fountain occupies a central position, and from it the principal streets diverge. Waterbury is widely noted for the extent and variety of its manufacturing interests, which are promoted by the excellent power furnished by the rivers. According to the census of 1890, nearly half of the entire capital, or $8,192,219, was invested in 15 plants, manufacturing brassware in a great variety of forms. Foundry and machine shop products, buttons, hardware, watches, clocks, and German silverware are also produced in large quantities. There are nearly 20 buildings used for public school purposes, including a high school. The value of public school

property exceeds $600,000, and the annual expenditure for public education $160,000. Among private schools, St. Margaret's diocesan school (Prot. Epis.) and the convent of Notre Dame (R. C.) have high rank. The noteworthy buildings include the city hall, high school, Silas Bronson public library, and, among about 25 churches, St. John's (Prot. Epis.), one of the most beautiful in the state, with a spire 200 feet high. There are also Masonic and Odd Fellows' halls, a state armory, opera house, and several hotels. The city has electric light and street railroad plants, waterworks supplied from two large reservoirs, one of which receives mountain water from Litchfield co., 11 miles distant, the entire plant costing nearly $1,000,000, and excellent sewerage. There are several national, savings, and private banks, and daily, weekly, monthly, and quarterly periodicals. In 1896 the city had a net debt of $875,500, and, at a rate of one-fourth of actual value, an assessed property valuation of $10,700,000. Pop. '90, town, 33,202; city, 28,646.

WATER CALTROPS. See TRAPA.

WATER CHESTNUT, *Marron d'eau* the name given in France to the edible seeds of the *trapa natans* (see TRAPA).—The name water chestnut is also given to the edible tubers of the *scirpus tuberosus*, a plant of the natural order *cyperaceæ* (see BULRUSH and CYPERACEÆ), which is cultivated by the Chinese in tanks very abundantly supplied with manure. It is destitute of leaves, except a slender short sheath or two at the base of each culm. It is stoloniferous, and the tubers are produced on the stolons. They are in high estimation among the Chinese, both for food and as a medicine, and are eaten either raw or boiled. They are called *pi-tsi* or *maat-ai*.

WATER-COLOR PAINTING, in some of its forms, was employed from the most ancient times until the middle ages, when oil was sometimes added to the gum, with which the colors were prepared. About 1410 the brothers Van Eyck, at Ghent, made improvements in the use of oil-colors, which entitle them to be called the initiators of the modern school of oil-painters. In the method known as *distemper*, the pigments are ground up with size and water, or with gum-water. In ancient Egyptian paintings the colors, mixed with gum and water, were sometimes laid immediately on stone walls, sometimes on a coating of plaster, on wood, and baked or wet clay. The Greeks mixed their colors with gum, the yelk and white of eggs, and water. Sometimes, it is said, milk also was added. The gum was used to make the paint adhere after the water had evaporated. Until 1410 the Italian artists employed the distemper of the ancients; and afterward they still used it in fresco-painting. Michael Angelo employed it in his greatest works, and thought oil-painting unworthy of a true artist. Most artists of that day painted their easel pictures in oil, and their frescos in distemper. In the true fresco the colors, mixed with water, are applied directly to the smooth wet surface of good lime mortar, when a crystalline surface is formed, which almost excludes water. In dry fresco, the plaster, having first dried thoroughly, the artist moistens again as large a part of it as he can cover with color at a single sitting.

Water-color painting, the most delicate of the graphic arts, is in an especial sense an English art. It was in England first that it attained to the dignity of a recognized artistic pursuit, and came to be—what it now is—admittedly the rival of oil-painting in brilliancy and power. It has had a large share in the modern prosperity of the fine arts; and of late has been practised by eminent artists in various countries, as France, Germany, and Austria. In the illumination of missals, water-colors were used mixed with the body white; and the same is true of the miniature painting of the 18th c. Frescoes and painting in tempora were also in a sense works in water-color. But the art of water-color, as we now understand the term, had its origin in quite a different way. Dürer, and certain of the German, Dutch, and Flemish artists, were accustomed to outline drawings with a reed pen and fill in those outlines with an auxiliary flat wash. Gradually the hard lines were replaced by touches with the brush, and the result was a monochrome in browns and grays, bistre, or Indian ink. These again came to be tinted, and so suggested the full use of colors. Rembrandt often drew in brown, and added dashes of strong color; and Rubens produced something very like modern water-color drawings. The modern art became emancipated from the old traditions by "gradual disuse of the general shadow tint; and imitation of the local color, not alone of the objects themselves, but of every modification resulting from light, dark, half-tint, or distance, a method which at once led to far greater truth and richness than could ever have been attained by merely passing color over the universal shadow tint." The stained drawing gradually gave way to the more perfect tinted drawing. But the tinted style predominated till 1790; and it may be said that the water-colors of the 18th c. were tinted monochromes. It was in the 19th c. that Girton and Turner showed what scope and power there was in the art. Artists who used the stained and tinted manner were Malton (1726–1801), Paul Sandby, R.A. (1725–1809), often called, though without justification, "the father of water-color art"; also (all in the last half of the 18th c.) Grimm, Webber, Clevely, Pars, and Rooker. Wheatley, Westall, and Gilpin used water-color as well as oil. Rowlandson, Cristall, Hills, Wright, Mortimer, Gresse, Hearne, J. R. Cozens, and Dayes greatly promoted the growing art. Nicholas Pocock (1749–1831) displayed a new richness and force. John Smith (Warwick Smith) first advanced beyond the weakness of mere tinting. Thomas Girton (1773–1802) attained great richness of tone and breadth; his compositions were grand but simple; he massed light and shade in broad and sometimes abrupt forms. J. M. W.

Turner (1775–1851 : see TURNER) soon distanced all his predecessors and contemporaries, and in his hands water-color painting became a new art. He wholly abandoned preliminary tinting; minute details are imitated in local color; his work is marked by breadth, fullness, warmth, as well as grace. Other more or less important names are those of Delamotte, Varley, J. J. Chalon, A. E. Chalon, Samuel Prout, Peter de Wint, Liverseege, Cotman, David Cox, Essex, Richardson, Newton, Copley Fielding, Robson, W. Hunt, Ross, Harding, Cattermole, Holland, Penley, Lewis, Houghton, Pinwell, Birket Foster, Sir John Gilbert, Herkomer, etc.

In the exhibitions of water-color paintings yearly held in the United States, particularly in New York, great variety in technique and subject is seen, but no distinctive American "school" has as yet been developed. Among the artists prominent in figure painting are Winslow Homer, William M. Chase, C. Y. Turner, Robert Blum, Irving R. Wiles, Thure de Thulstrup, the Morans and Mrs. Rhoda Holmes Nichols; in landscape, may be mentioned Alexander Wyant, J. Francis Murphy, Samuel Colman, R. Swain Gifford, Henry Farrer, and Childe Hassam; in marine painting, William T. Richards and Charles A. Platt; in architecture, Harry Fenn and Hughson Hawley; in flowers and still-life, the Misses Greatorex and Mrs. Julia Dillon. The best guides for one desiring to learn the art of water-color painting are the handbooks published by Winsor and Newton, one of which, Aaron Penley's *Sketching from Nature in Water-Color*, is of especial excellence. See also the chapter on Water-Color painting in Hamerton's *The Graphic Arts*, and the historical work by Penley, *The English School of Painting in Water-Colour*.

At present, water-color paintings may be divided into three kinds : (1) those where the coloring is mainly transparent; (2) where it is usually opaque; (3) where transparent, semi-transparent, and opaque colors are freely used in combination. The quick drying of the water-color pigments is favorable to rapid execution, and greater clearness of color is attained than is practicable in oils. The progress of the art has been greatly promoted by modern chemical developments in the preparation of the colors—great variety of really permanent colors being now procurable. These are various pigments ground with gum or other mucilage, and may be kept in cakes, the usual vehicle for moistening and applying them being gum arabic and water. But for artists they are now usually prepared so as to be kept moist in small earthenware pans or metallic tubes. The British society of painters in water-colors was instituted in 1804; and the American Society of Painters in Water-Colors, in 1867.

WATER-COLORS are painters' colors mixed with water and some adhesive material, as gum or size, instead of oil. Those intended for drawings on paper are prepared with great care, and are usually formed into dry cakes with gum. Those for coloring walls and scene-painting are roughly prepared with glue or size. These are often called distemper colors, from the Italian term *tempera*, applied to them to express their application to temporary purposes.

WATERCOURSE, in law, means a stream flowing naturally and constantly between ascertained banks. Ownership in a watercourse is included under the name land; and a conveyance of land vests in the grantee not only the land strictly so-called, but all the streams crossing the surface of the land. In case of a division of two estates by a watercourse, the estate of each proprietor is bounded by the central line of the stream. Proprietors of land adjoining a watercourse are called riparians. All owners of lands through which water flows have the same rights, a usufruct in the water, to a reasonable use of which every riparian proprietor is entitled; but one is not allowed to flow it back upon the proprietor above him, or to flood the proprietor below. A navigable watercourse, if it lie entirely within the limits of a state, is subject to the authority of the state government. A navigable river, flowing between two or more states, is subject to the right of congress to regulate commerce between the states. The proprietors of land lying along a navigable watercourse are not owners of its bed.

WATER-CRAKE. Another name for the water-ousel, or dipper (q.v.).

WATER-CRESS. See CRESS.

WATER-CROW. See DIPPER.

WATER-CROWFOOT, a popular name for certain aquatic species of *ranunculus* (q.v.). Among those found in the United States is the indigenous *R. multifidus*, the YELLOW WATER-CROWFOOT, found from eastern New England to Illinois and northward, and *R. aquatilis*, the common WHITE WATER-CROWFOOT, introduced from Europe.

WATER-CURE. See HYDROPATHY.

WATER-DOCTOR, originally meant a physician who diagnoses a case by means of observations taken from an inspection of the urine. At present, however, it is the popular designation of an hydropathist. See HYDROPATHY.

WATER-DOG, a kind of dog, of which the poodle (q.v.) is regarded as a sub-variety. The head is rather large and round, the ears long, the legs rather short, the general form compact, the hair everywhere long and curly. The water-dog of England, common before the poodle had been introduced from the continent, is still much esteemed by professional wild-fowl shooters, and by the fishermen of the north-eastern counties.

WATER-DROPWORT, *Œnanthe*, a genus of plants of the natural order *umbelliferæ;* having ovato-cylindrical fruit, not prickly nor beaked, each carpel with 5 blunt convex ribs, and single vittæ in the interstices; the calyx teeth lanceolate; the petals obcordate and radiant, with an inflected point; the partial involucre of many rays; the flowers of the circumference on long stalks and sterile, those of the center subsessile and fertile. A number of species are natives of Britain—large perennial plants, with a strong and generally disagreeable aromatic smell, and compound or decompound leaves. The COMMON WATER-DROPWORT (*Œ. fistulosa*) and the HEMLOCK WATER-DROPWORT, or WATER HEMLOCK (*Œ. crocata*), are both common in wet places in Britain and throughout Europe, and both are narcotic acrid poisons. The roots of the latter have some resemblance to small parsnips, and hence fatal accidents have frequently occurred. The FINE-LEAVED WATER-DROPWORT, called water fennel by the Germans (*Œ. phellandrium*, formerly known as *phellandrium aquaticum*), is also common in ditches and ponds both in Britain and on the continent. It has a jointed root-stalk (*rhizome*), with tufted whorled fibers and a strong zigzag stem dilated at the base. The leaves are decompound. The fruit has a peculiar aromatic but disagreeable smell. It is not so poisonous as the other species just named. It was at one time erroneously regarded as a specific against pulmonary consumption; but it has been advantageously employed in pulmonary complaints.

WATEREE', a river of the United States, formed by the junction of the Catawba and Fishing creek in the s.e. part of Chester co., South Carolina, runs s.e. and unites with the Congaree to form the Santee. Steamboats ascend the Wateree to Camden, 200 m. from the sea.

WATEREE, a township in Kershaw co., S. C.; pop. '90, 4698.

WATERFALL is a break in the continuity of slope of the channel of a river or stream, so abrupt that the body of water *falls* from the higher to the lower level. Waterfalls occur most frequently in mountainous countries, where the streams from the mountain-sides enter the valleys. It is only when the side of the valley is composed of hard rock that there can be a waterfall; in friable strata the stream wears out a ravine or side-valley. These mountain waterfalls, however, are generally rather curious and picturesque than grand, the volume of water being in most cases comparatively insignificant, though the height of fall is occasionally very great. All mountain waterfalls necessarily change their aspect from season to season—in winter, a roaring torrent plunging headlong into the abyss; in summer, often a mere film of water trickling down the face of the precipice. Waterfalls in comparatively level districts are not nearly so common, and their height of fall is insignificant compared with that of mountain cataracts; but the much greater volume of water, its steady and even flow to the head of the precipice over which, in solid column, it descends with a thundering plunge, place such waterfalls among the grandest of nature's phenomena. It is where the course of a large river passes from a higher to a lower plateau, and where the upper plateau is edged with rock, that the grander cataracts are formed. If the rocks are of the same hardness from top to bottom, the edge of the escarpment, supposing it to be perpendicular at first, becomes worn off, and a slope or *rapid* is formed. But when the upper edge is hard and the under strata soft and friable, the reverberation of the spray wears away the softer parts below, leaving a projecting ledge at the top, which breaks off, piece by piece, as it becomes too much undermined, so that the fall is constantly receding. The question of the rate of regression of waterfalls has not hitherto occupied much attention, and has only been estimated in the case of Niagara, Bakewell giving its annual value at one yard, while Lyell limits it to about a third of this. Some of the most remarkable waterfalls of the world are the Yosemite, California, in a valley of the same name; a fall 2,550 ft. in entire height, but broken into three leaps; the Orco falls at Monte Rosa, 2,400 ft.; Gavarnie (Pyrenees), 1400 ft.; Staubbach (Switzerland), 1000 ft.; Maanelvan (Norway), 940 ft.; Niagara (q.v.); Zambezi (q.v.); Missouri; the great Kaietur fall in British Demerara, over 700 ft. The cataracts of the Velino and Anio, in Italy, are artificial.

WATER FLEA, *Daphnia*, a genus of *entomostraca*, of the order *cladocera*, and family *daphniadæ*. One species, *D. monoculus*, is abundant in pools and ditches in Britain. It comes to the surface in the mornings and evenings, but keeps near the bottom during the heat of the day. It swims by taking short springs, whence its popular name. It feeds on minute particles both of animal and vegetable substances. It is a beautiful object for the microscope; the whole interior organization being visible through the transparent carapace. The male is much smaller than the female, and comparatively rare. The eggs, after leaving the ovary, are retained in a cavity between the body and the carapace, until the young have attained almost their perfect form. See illus., CRUSTACEANS, ETC., vol. IV.

WATERFORD, a maritime co. of the province of Munster, Ireland, is bounded on the n. by the counties of Tipperary and Kilkenny, on the e. by Wexford, on the s. by St. George's channel, and on the w. by the co. of Cork. Its greatest length from e. to w. is 52 m., and its breadth n. to s. 28; the total area being 721 sq. m. The pop. in '51 was 164,051; in '61, 134,252; in '71, 123,310; in '81, 112,768; and in '91, 98,251. The fishing-grounds on the coast, once thought inexhaustible, are now said to be unproductive. The coastline extends from the estuary of the Suir, Waterford harbor, to that of the Blackwater at Youghal, and is partly flat, partly rocky, but in general very dangerous

for shipping. The rocky district contains some remarkable caverns. The surface is in general mountainous; the principal ranges being Knockmeledown, the Cummeragh, Monevolagh, and Drum. The Cummeragh mountains are the loftiest, and abound in wild and picturesque scenery. The Suir (q.v.) and the Blackwater (q.v.) are the chief rivers. There are no lakes worthy of note. The climate is moist, and the soil, over a considerable part of the county, is marshy; but the upland districts are well suited for tillage, and the lower pasture-lands, although inferior in fattening properties to those of the great central plain, produce excellent butter, which is exported in large quantities. In geological structure, the mountains present the old and new slate, separated by red and gray quartz rock and quartzose slate. Of quarry slate, there are two principal varieties, which are raised extensively for local use. The valleys belong to the limestone series, being an outlying prolongation of the great bed of the central plain. Lead, iron, and copper are found. The former two have proved unprofitable, but the copper-works at Bonmahon and Knockmahon have for many years been very productive. Marble of several colors and of considerable beauty is quarried near Cappoquin and Whitechurch, and potter's clay of good quality is found at Kildrum, near Dungarvan. The chief occupations of the population are pasturage and dairy farming; but a considerable manufacture both of cotton and linen has been recently introduced at Portlaw, and the shipping-trade has of late years become active and profitable.

Waterford is divided into eight baronies. The most considerable towns besides Waterford city (q.v.) are Dungarvan, Carrick-beg—properly a suburb of Carrick-on-Suir, which is in Tipperary—Lismore, Cappoquin, Tallow, and Tramore. Clonmel, although chiefly in Tipperary, lies partly within this county. Waterford returns three members to parliament—two for the county, and one for Waterford city. This district, in common with the adjoining county of Wexford, is believed to have been anciently peopled by a Belgic colony. The Danes also formed a settlement at the mouth of the Suir. From the date of the invasion, Waterford became a stronghold of the English, large grants having been made by Henry II. to the family of Le Poer; and in all the alternations of the subsequent struggle with the Irish population, it continued for the most part a firm center of English influence. The county abounds with antiquities, ecclesiastical and military, and of the Celtic and Danish, as well as the Anglo-Norman period.

WATERFORD, a town and village in Saratoga co., N. Y.; at the junction of the Hudson and Mohawk rivers, and on the Champlain canal and branches of the Delaware and Hudson railroad; 4 m. n. of Troy. There are gas and electric lights, electric street railroads connecting with Troy and Cohoes, a private bank, high school with library, and waterworks supplied from the Hudson river. Excellent power for manufacturing is provided by the falls of the Mohawk. The manufactures include knit goods, screw plates, stocks and dies, lamp black, boilers, and foundry and machine shop products. Waterford was incorporated in 1794 as Half Moon Point, and was set off from the town of Half Moon in 1816. Among the local attractions are remains of earthworks thrown up to resist an expected movement by the British under Burgoyne in the Revolutionary war. Pop. '90, 5286.

WATERFORD, a city, capital of the co. of the same name, but itself a co. of a city, and a parliamentary borough, is situated in n. lat. 52° 16′, w. long. 7° 6′ on the river Suir, 12 m. from the sea, and 97 s.s.w. from Dublin, from which city it is connected by the Great Southern and Western, and Waterford and Limerick railways, as also by the Waterford, Dungawan and Linmore railway. The city, with the exception of an inconsiderable suburb, with which it is connected by a bridge of 39 arches, 852 ft. long, opening for the passage of ships, lies on the right bank of the Suir, along which a handsome and spacious quay extends for a distance of nearly a mile, and from which the city ascends gradually in well-built streets. Vessels of 2000 tons are now enabled to discharge their cargoes at the quay; but there is an anchorage for still larger ships about 6 m. lower down the river, at Passage. The chief public buildings are the Protestant and Roman Catholic cathedrals, the Protestant Episcopal palace, the (Catholic) college of St. John, the model national school, and the city and county court-houses. Ring or Reginald's tower was erected in 1802, and rebuilt 1819. In addition to the union workhouse, there is an infirmary, a dispensary, a fever hospital, a district lunatic asylum, and a penitentiary. The chief trade is with England, in the export of butter, pork, bacon, corn, flour, eggs, and live-stock. Steam-navigation has received a great impulse, and there is now a ship-building yard, with patent slip, graving-bank, and dock, on the Kilkenny bank of the river. Pop. '91, of parliamentary borough, 27,623. One member is returned to parliament.

Waterford is originally of Danish foundation; but at the invasion, the city was taken by assault by Strongbow, by whom it was enlarged, and made a place of strength. It received a charter from John, which was forfeited under James I., but restored by Charles I. in 1626. But few remains of its ancient buildings are now to be seen.

WATER-GAS, a term first applied to hydrogen on account of its being the gas which was liberated when steam was brought into contact with red-hot iron; the oxygen of the steam uniting with the iron, forming oxide of iron, while the hydrogen was evolved. Subsequently it was discovered that, when carbon was employed in place of iron, there was not only hydrogen liberated, but oxide of carbon, which is also a gas; it was then found that, if this mixture of hydrogen and oxide of carbon was enriched by the addition of naphtha, etc., it would make an illuminating gas; but so far as known, there was

no practical application made of this fact till 1830, when Michael Donovan patented a process for the manufacture of an illuminating gas composed of hydrogen and oxide of carbon, enriched to give it illuminating power, which was called water-gas, and was essentially the same as is now manufactured under that name. A Belgian by the name of Jobard obtained a patent for water-gas in 1832; and later, George Lowe, an English engineer, also obtained a patent. M. Selligne, of Paris, employed three iron retorts for making water-gas, two of which contained charcoal, while the third was two-thirds filled with red-hot iron chains, upon which a slow stream of shale oil was allowed to flow. Steam was passed into the first retort, where it was decomposed; from thence into the second, where the red-hot charcoal converted any CO_2 (carbonic acid) into CO (carbonic oxide). The gases then passed into the third retort containing the red-hot chains upon which the "shale oil" was flowing and being vaporized, thereby imparting to the gases illuminating properties. Later, Mr. Kirkham, an English engineer, took hold of the process, and, in 1852, it was patented in England by Messrs. John and Thomas Kirkham. An attempt was then made to introduce it into England, but without much success. It was then taken to Paris and there created considerable excitement, and was about to be extensively introduced, when, by some misunderstanding in regard to its poisonous properties, it was abandoned. In 1871 there was introduced into this country a process called after its inventor, Tesse du Motay; it is now in use by the municipal and New York gas-light companies in New York city. Water-gas, before being enriched, has a specific gravity of about one-half that of air; it has a strong odor, and burns with an almost non-luminous flame, producing an intense heat. It consists of about equal parts of hydrogen and carbonic oxide, some marsh gas, and a small percentage of carbonic acid, sulphur compounds, and any volatile impurities in the coal. After being enriched and purified it still has a strong odor and a gravity of about .66 compared with air. Its illuminating power is from 25 to 30 candles. It requires less oxygen to burn it, but will not explode as quickly as coal gas, and when exploded exerts less shock, as is shown by windows being blown out without breaking the glass. The fact that it can be produced with rapidity from smaller apparatus, and, as is claimed, more economically than coal gas, seems to indicate for it an extended use in the future.

WATER-GLASS, the soluble silicates of potash or soda, or a mixture of both. It is usually prepared by boiling silica with caustic alkali under pressure, about 60 lbs. to the square inch, in a digester. When pure and solid, it has the appearance of common glass, and is slowly soluble in boiling water. A solution of water-glass is used, mixed with sand, etc., to form artificial stone. It is also spread on the surface of stone to protect it from decay, as it sinks in and cements the particles together; and it enters into the composition of some kinds of cement. In the art of stereochromy, or fresco-painting (q.v.), water-glass is now much used. It has also become useful in certain dyeing processes, having in some cases been found to answer the purpose of dunging.

WATER-HEN. See GALLINULE.

WATERHOUSE, ALFRED, b. 1830, an English architect, studied the practice and theory of his profession in the office of a Manchester architect from 1848 to 1853, after which he spent some time traveling in Italy. His first great work was the building of the court of assize at Manchester, his plan having been accepted after a public competition; and he afterwards designed the county prison. His next works were the new building of Balliol college, Oxford, and of Caius college, Cambridge. Other important buildings designed by him are the Manchester city hall, Pembroke college, Cambridge, Owen's college, Manchester, the South Kensington natural history museum, London, Eaton hall, Cheshire, and Iwerne minster, Dorsetshire. He is an admirer of Gothic architecture, and his works are generally in that style.

WATERHOUSE, BENJAMIN, 1754–1846; b. R. I.; educated at London, Edinburgh, and the university of Leyden. He was professor of theory and practice of medicine in Harvard university, 1783–1812; was appointed U. S. hospital surgeon in 1812, and was post-surgeon, 1818–21. He delivered the first course of lectures on natural history ever given in this country, into which he introduced the study of mineralogy. He secured the foundation of the Cambridge botanic garden. He defended Jenner's discovery of vaccination, and wrote several books.

WATERLAND, DANIEL, D.D., a clergyman of the English church, prominent in the theological controversies of the first half of the 18th century. He was born on Feb. 17, 1683, at Waseley in Lincolnshire, of which parish his father was the rector. After going through the usual course of study at Magdalen college, Cambridge, he was admitted into orders; and in 1713 he became rector of Ellingham on the nomination of the earl of Suffolk. It was shortly after this that he published his first book, *Advice to a Young Student, with a Method of Study for the first Four Years*—an unpretentious but useful work, which soon became very popular, and brought its author into notice. King George I. appointed him one of his chaplains in 1717. About this period he began to be engaged in theological controversy, one of his earliest works being a criticism of a book by Dr. Whitby, in which a severe attack was made upon bishop Bull's *Defence of the Nicene Creed*. Whitby answered him; Waterhouse rejoined; and in 1719 the latter expanded his writings upon this subject into his *Defence of Christ's Divinity*. This work

was sharply criticised by Dr. Clarke and other Arians; to whom Waterland replied in a work published in 1724. Upon the same subject he, in 1720, preached and published a series of sermons at the request of the bishop of London. Within a few years after this he passed through a rapid course of promotion in the church. In 1721 he was appointed rector of the parish of St. Augustine in the city of London; in 1724 he got the chancellorship of the cathedral of York. He was appointed a canon of Windsor in 1727, and archdeacon of Middlesex in 1730. He held along with the latter appointments the valuable living of Twickenham. During these years he was indefatigable in controversy; not only keeping up a paper war against the Arians, but entering the lists against free-thinkers, such as Middleton and Tindal, and against those of the Anglican body who did not share his doctrines upon the subject of the Trinity and the eucharist. *A Critical History of the Athanasian Creed* (1724); *A Review of the Doctrine of the Eucharist* (1737); and *Scripture Vindicated* (1734), are considered among the most noteworthy of his productions. In 1738 were published two volumes of his sermons, edited by one of his friends—the one upon Justification, the other upon the Communion of Infants. Waterland died on Dec. 23, 1740. A complete edition of his works, accompanied by a pretty full memoir of his life from the pen of Bishop Van Mildert, was published at Oxford in 1823, in ten vols. 8vo; an eleventh vol. containing a general index, was added in 1828.

WATER-LILY, a name commonly enough given to the different species of *nymphæa* and *nuphar*, and also of *nelumbium*, all genera of the natural order *nymphæaceæ* (q.v.), and indeed often extended to all the plants of that order. Britain produces three species —*nymphæa alba*, the white water-lily; and *nuphar luteum* and *nuphar pumilum*, called yellow water-lilies. The two former are frequent in still waters in most parts of the island; *nuphar pumilum* is more rare, and chiefly found in Scotland. All have heart shaped leaves, floating on the water. The beautiful and fragrant white flowers of *nymphæa alba* float upon the water; the flowers of the yellow water-lily, which are of comparatively little beauty, are raised by their stalks a little above it. The seeds of these, as well as of the water-lily of the Nile, (*nympæa lotus*—see Lotus), are farinaceous, and are sometimes used for food. The Turks prepare a cooling drink from the stems of *nuphar luteum*.—The Sweet-Scented Water-Lily of North America, *nymphæa odorata*, has a large white flower of great beauty, and of very sweet smell. Not only *nymphæa lotus*, but also *N. rubra* and *N. pubescens*, are regarded as sacred plants by the Hindus. *N. cærulea* was also held sacred by the ancient Egyptians.

WATERLOO, a co. in central Ontario, drained by the Grand river; 530 sq.m.; pop. '91, 50,464. Co. seat, Berlin.

WATERLOO, city and co. seat of Blackhawk co., Ia.; on the Cedar river and the Burlington, Cedar Rapids, and Northern, the Chicago Great Western, and the Illinois Central railroads; 93 miles w. of Dubuque. It has gas and electric lights, street railroads, waterworks, good sewerage, national and state banks, about 15 churches, collegiate institute, West high school, public library, school for stammerers, conservatory of music, and daily, weekly, and monthly periodicals. The river affords valuable power. The manufactures include locomotives, electric cars, paper, gasoline engines, well-drilling machinery, and many minor articles. Pop. '90, 6674.

WATERLOO, a township and town in Laurens co., S. C.; pop. '90, township, 3669; town, 291.

WATERLOO, Battle of, the decisive conflict which annihilated the power of Napoleon I., was fought June 18, 1815, in a plain about 2 m. from the village of Waterloo, and 12 m. s. from Brussels. Agreeably to the unanimous resolve of the allies to attack Napoleon on all sides, and crush him as they had done in 1814, British and Prussian troops were stationed in the Netherlands, under the command of Wellington and Blücher respectively, in order to attack France on the north. Napoleon, on his side, well aware that for a considerable time no weighty attack could be made on France except by these forces, and fully recognizing the immense advantage to be gained by destroying one enemy before the others could come up, rapidly concentrated the bulk of his troops; and with a suddenness and secrecy which defied all effective counter-preparations, crossed the Belgian frontier, and fell with one part of his forces on the Prussians at Ligny (q.v.), and with the other part, under Ney's immediate command, on the army of the prince of Orange at Quatre-Bras (q.v.). The Prussians—as Wellington, after learning Blücher's dispositions for the battle, had foretold—were, after a contest of the most obstinate description, completely defeated; but the prince of Orange, by the aid of the re-enforcements promptly forwarded to him by the English commander, succeeded in withstanding Ney's attack. In the plan preconcerted by the allied generals such a result was not unforeseen, and in accordance with their scheme of firm resistance and retreat if necessary (to allow time for the Russians and Austrians to assemble on the eastern frontier of France), Blücher retreated northward (instead of eastward, as Napoleon expected,) nearer the place of rendezvous with Wellington at Mont St. Jean; while early on the morning of the 17th, the Anglo-Netherlanders retired along an almost parallel route till they reached the forest of Soignies, in front of which they were formed in battle-array, facing southward. Napoleon, imagining that the Prussians were in total rout, and that their complete dissipation would easily be accomplished by Grouchy's division (33,000 men), which he had sent in pursuit, crossed to Quatre-Bras

with the rest of his troops, and uniting with Ney, marched in pursuit of Wellington, arriving on the plain of Waterloo in the evening.

The two armies which then confronted each other, though nearly equal in strength, were composed of very different materials. The French army, numbering from 69,909 to 72,247 men (according to French authorities, English historians varying in their estimate from 74,000 to 90,000, though its exact strength cannot be ascertained, owing to the loss of the official returns), was composed of veteran troops, who had enthusiastically ranked themselves once more under the standard of the chief who had so often led them to victory. The Anglo-Netherlands army, which numbered 69,894, of whom only 25,389 were British, 6,793 of the king's German legion, 10,995 Hanoverians, 6,303 Brunswickers, 2,926 Nassauers, and 17,488 Netherlanders, consisted, with the exception of a small number of Peninsula veterans, wholly of young soldiers, a large proportion of whom had never been under fire; the Hanoverians were only militia, some of them being fit but for garrison duty; while the behavior of many of the Belgian troops during the battle showed plainly enough that they mainly increased the *numerical* strength of the army, as they left it to the Dutch soldiers to vindicate the wrongs of the Netherlands. The French had 240, while their opponents had only about 156 guns. With such an army, to maintain even a defensive conflict with an army of veterans, commanded by the greatest gen. of the time, was a task which (laboring under a mistake as to the exact superiority in number of his opponents) it required all Wellington's rare tenacity of purpose to undertake; yet undertake it he did, depending on Blücher's promise to join him an hour after midday.

On the morning of the 18th, the two armies found themselves ranged in battle-array opposite each other: the allies, posted on a line of eminences, had their left wing resting on Frischermont, the farm-house of La Haye Sainte in front of their center, while their right wing curved convexly round behind Hougomont, and rested on Braine Merbes. The French were ranged on a parallel row of eminences, having La Belle Alliance in their center, with some divisions of cavalry and infantry in reserve behind the right wing; Kellermann's dragoons behind the left wing; and the guard, stationed with the 6th corps, in the rear. Skirmishing had continued all the morning; but the first serious attack was not made till between eleven and twelve, when a part of the 1st corps advanced against Hougomont, with the view of making the more important attack to be made against the allied left. This preliminary assault, however, though unsuccessful, was maintained with great vigor for a considerable time; till Napoleon, dreading a further loss of time, prepared to make his grand attack on the left center. At this time (half-past one P.M.), he learned that the advanced guard of the 4th Prussian corps (Bulow's) was appearing in front of St. Lambert, 2 to 3 m. to his right; and being forced to detach his 6th corps (Lobau's) with the reserves of cavalry behind his right wing, to keep them in check, he had to modify his grand plan of atttack on the Anglo-Netherlanders, and accordingly ordered Ney to break through their center. At two P.M., after a furious preliminary cannonade, from which Wellington sheltered his men (as at various other times during the battle), by retiring them to the reverse of the slope, Ney advanced against the left center with 20,000 men, but had only succeeded in putting to flight a Belgian brigade, when he was attacked and driven back by Picton's division, his retreating columns charged and broken by the English cavalry, and 2,000 prisoners taken. Nevertheless, after a brief space, Ney returned to the charge, and carried La Haye Sainte, though his repeated attacks on the infantry in position were constantly repulsed, and his retreating columns severely handled by the British cavalry, who, disordered by success, were as often overthrown by the French cuirassiers. By this time (half-past four P.M.), Bulow had succeeded in deploying from the woods, and, advancing against Planchenoit, in the rear of the French right, carried it after a vigorous conflict. Lobau's corps, however, aided by a re-enforcement from the guard, speedily re-took the post, and driving the Prussians back into the wood, secured the French right flank for a time; Napoleon, though now learning that another Prussian corps (the 1st, under Ziethen) was coming up by Ohain to join the allied left, being still confident that he could destroy the Anglo-Netherlanders before the Prussians could render effective aid. During the conflict with Bulow, Ney had been warmly engaged with the center and right of the enemy, who had made various attempts to regain the wood of Hougomont and La Haye Sainte, and had supported his repeated attacks with not only his own cavalry, but (by, at any rate, the "tacit consent" of the emperor) with the cuirassiers, lancers, and chasseurs of the guard, and the whole of the mounted reserve, without, however, producing any result other than a great slaughter on both sides, and the useless sacrifice of 18,000 of the finest cavalry ever seen. Napoleon now resolved on another vehement assault on the immovable British center, and directed against it in succession two columns, one composed of four battalions of the middle guard, and the other of four battalions of the middle and two of the old guard, supporting them with flank attacks of other infantry divisions, of cavalry, and with a dreadful fire of artillery. The advancing French were met with a well-sustained fire from every piece which could be brought to bear upon them; the first attacking column was fairly driven down the slope by the English guards, and the second was totally routed by a bayonet-charge of Adams' brigade, the British cavalry following up the fugitives. Ziethen had now (7 P.M.) joined the left of the English line; Bulow, further re-enforced, had carried Planchenoit, and

was driving the French right wing before him: and the combined attack on the retiring masses of the French by the whole effective force of the Anglo-Netherlanders on the one side, and of the Prussian cavalry on the other, converted an ordinary, though severe defeat into a rout unparalleled in history. The magnificent cavalry, wantonly destroyed by Ney in fruitless attacks upon an "impracticable" infantry, would then have been of incalculable service, but they were no longer to be had. The last square of the guard still stood its ground, to protect the flight of the emperor; but it was speedily surrounded, and on the soldier-like refusal of Cambronne to surrender, was in a moment pierced through and broken to pieces. From this time all resistance was over; the roads southward, especially that to Genappes, were crowded with fugitives fleeing for their lives from the pursuing cavalry; and though the English light cavalry, exhausted with their severe work during the battle, soon ceased the pursuit, it was kept up with great energy throughout the whole night by the Prussian troopers, who seemed bent upon at once avenging the defeats of Jena, Auerstadt, and Ligny, and glutted their fierce animosity by an indiscriminate slaughter. The total loss in this battle was, from the obstinacy and determination with which it was contested, necessarily large; the figures are: British and Hanoverians, 11,678; Brunswickers, 687; Nassauers, 643; Netherlanders, 3,178; a total of 16,186; which added to 6,999 Prussians, gives the aggregate allied loss, 23,185. The French had 18,500 killed and wounded; 7,800 prisoners (some French accounts raise the total list of *hors de combat* to 32,000), and 227 cannon captured.

This great battle has given rise to numerous controversies among the British, French, and German historians of the great struggle between Europe and Napoleon—the points in dispute being, (1) as usual, the numbers engaged on each side, (2) the ability shown by each general in his dispositions for the conflict, and (3) the relative share of the British and Prussians in producing the final result. These questions can be briefly and satisfactorily answered. The strength of the English army is known from official estimates; the French army, as shown by its maneuvers throughout the day, was more numerous, and though its amount cannot, with perfect accuracy, be ascertained, it was certainly over 70,000, and under 80,000; but the fact that many Belgians in the duke's army took to their heels as soon as the French marched toward them, and fled direct to Brussels, increased the disproportion, already sufficiently great, between the two armies; the Prussians had only 35,000 men under fire at Waterloo, and half of these only for about half an hour. Fault has been found with Wellington for giving battle in front of a wood, but the accusation is foolish, as several good roads traversed the wood, thus affording means of retreat, if necessary, and the wood could have been held by skirmishers to protect the retreating infantry. Napoleon's faults were chiefly —the late hour at which he (not calculating on the arrival of the Prussians at all, and certainly not without Grouchy) commenced the conflict, and the reckless manner in which his cavalry reserves were wasted; and his neglecting to take into account the steadiness—a steadiness new to one of even his experience—with which, as he was warned by Soult, who knew it only too well, the British infantry were wont to maintain their ground. As to the third point, there is no doubt that Bulow's attack on Planchenoit distracted Napoleon's attention, and drew off 10,000 of his forces; but though the Prussians had not come up, the battle could not have been otherwise than a drawn battle; however, the effect of their successful attack on the French right, by taking in flank also the squadrons which recoiled before the invincible steadiness of the British, was the conversion of an otherwise drawn battle into a glorious victory.

WATER-METER, an instrument for measuring the amount of water flowing through a pipe. In many places where water is comparatively scarce it is customary to charge for it on a meter basis, and in testing the efficiency of boilers it is necessary to have an accurate measurement of the amount of water which is fed into them. One of the oldest forms of water-meter, which is still in very general use is the piston meter. These are made with both one and two pistons and in the case of the latter the motion of one of the pistons moves the valve which starts the other, and *vice versa*. In the single piston meter water is admitted first on one side of the piston and then on the other. In both cases the motion of the pistons actuate a train of wheel-work which registers either the number of gallons or the cubic feet of water which have passed through the meter. Another type of meter in extensive use is the Crown meter. The essential parts of this meter are an outside cylindrical case and a piston which is also a hollow cylinder of smaller diameter which has a slight motion of revolution so that its axis describes a small circle in the center of the case. The parts are so arranged that as the water passes through the meter the motion of the piston moves a train of wheel-work which registers the amount of water. Two other types of meters of importance are known as the disk meter and one that acts on the principal of the rotary pump. The Venturi meter is especially adapted to the measurement of large quantities of water. It consists simply in a contraction of the section of the pipe carrying the water and two small vertical pipes which are connected to the largest and the smallest section of the main pipe. The difference of pressure in these two small pipes is proportional to the rate of flow of water in the pipe. The indications are taken on a moving strip of paper.

WATER-POWER. The value of water-power depends much on the nature of the source of supply, whether steady or otherwise. Where streams supplying water-power are liable to fall off much in dry weather, large impounding reservoirs are necessary to keep the mills from being stopped during summer. These, however, being generally expensive concerns, are seldom made for one mill, but rather by some association of mill-

owners; and often by a water company or commission for supplying a town with water, to afford compensation to the mills by storing up flood-water, for what is abstracted for the use of the town. On small streams there is generally a pond provided fit to hold a night's water, or, perhaps, even a Sunday's, in addition; but in the case of large rivers, there is, in general, only a weir or dam across the river to direct the water into the intake lade. When the inclination in the bed of the stream is small, the lades require to be proportionally long, to give sufficient fall, and are often above a mile long or more from the intake to the lower end of the tail or discharge lade, where the water is returned to the stream. The rise and fall of the tide has been frequently used for driving water-wheels.

The most usual mode of applying water to the driving of machinery before the general adoption of turbine wheels was by means of a vertical wheel which is put in motion either by the water acting on blades or floats by impulse derived from its velocity acquired in falling, or by the weight of water being applied to one side of the wheel. The former mode of applying the water was generally adopted in low falls, say under six ft. or thereabouts, and to what is called an undershot wheel—i.e., a wheel where the effective head of water is below the level of the center; and to make the application efficient, that portion of the periphery of the wheel measuring from the point of impact of the water to a point directly below the center, requires to be surrounded by a casing, generally of stone, but sometimes of cast iron, called the arc, closely fitted to the extremity of the floats, so as to prevent any considerable escape of water.

The wheel, which may be either of timber or of cast-iron, or partly of both, consists of axle, arms, floats, which are generally radii of the circle, but are sometimes set a little obliquely to the radius, pointing up stream; and generally there are also a sole, being a lining round the circumference at the lower edge of the floats, having openings for the escape of air; and a shrouding or circular plate at each side of the wheel, and of the same depth as the floats.

Sometimes, when there is very little fall beyond the mere current of the stream, the floats simply dip into the water like the paddles of a steamer, in which case no sole or shrouding is required; and to make allowance for the rise of the water in the tail-lade during floods, which is generally called *back-water*, and seriously impedes and sometimes stops the motion of the wheel, occasionally the wheel and its arc are so constructed as to be capable of being raised or depressed together, without throwing the machinery out of gear.

The other mode of applying the water to a vertical wheel by making it act by its gravity, is the more perfect and economical mode, where circumstances will admit of it, and is generally adopted in falls of any considerable height, say of six ft. and upward, and where the water can be let on above the level of the center. The wheels are called respectively *breast* and *overshot wheels*, according as the water is let on more near to the level of the center or to the crown of the wheel; and they have, instead of straight floats, curved or kneed buckets, according as they may be made of iron-plate or of wood, and of such a shape as to retain the water down to the lowest possible point. There are generally in good wheels ventilating openings in the sole for the escape of air. The overshot wheel has this disadvantage that, as the water has little or no power until considerably past the top center, the wheel is burdened with a useless weight of water.

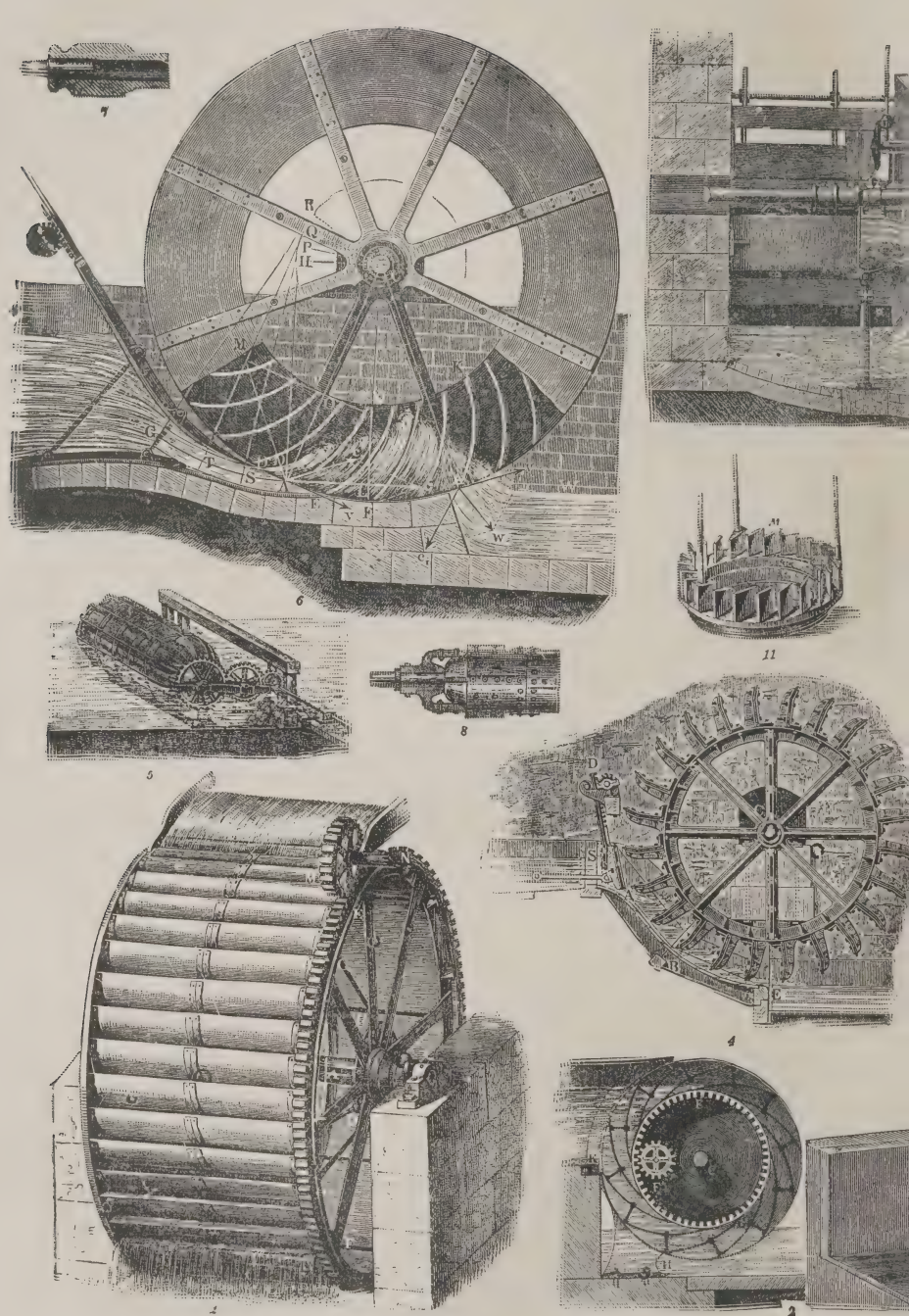
The direct overshot wheel has the water run, without changing its direction, right over the top; which arrangement has this advantage, that as the top of the wheel moves in the same direction as the stream, it gets the benefit of the whole initial velocity and impulse of the water; but, on the other hand, the bottom of the wheel, if at all immersed in water, which it generally is to some extent, meets with obstruction by moving against the current.

The *pitch-back overshot* is a modification of the last, making the water to pass alongside the wheel, and then to return and be let on the top of the wheel in a contrary direction. This requires longer and more complicated troughs, and by the change in direction, part of the impulse from the water is lost, but the bottom of the wheel moves in the direction of the tail-water, and is not liable to be impeded by being immersed in it.

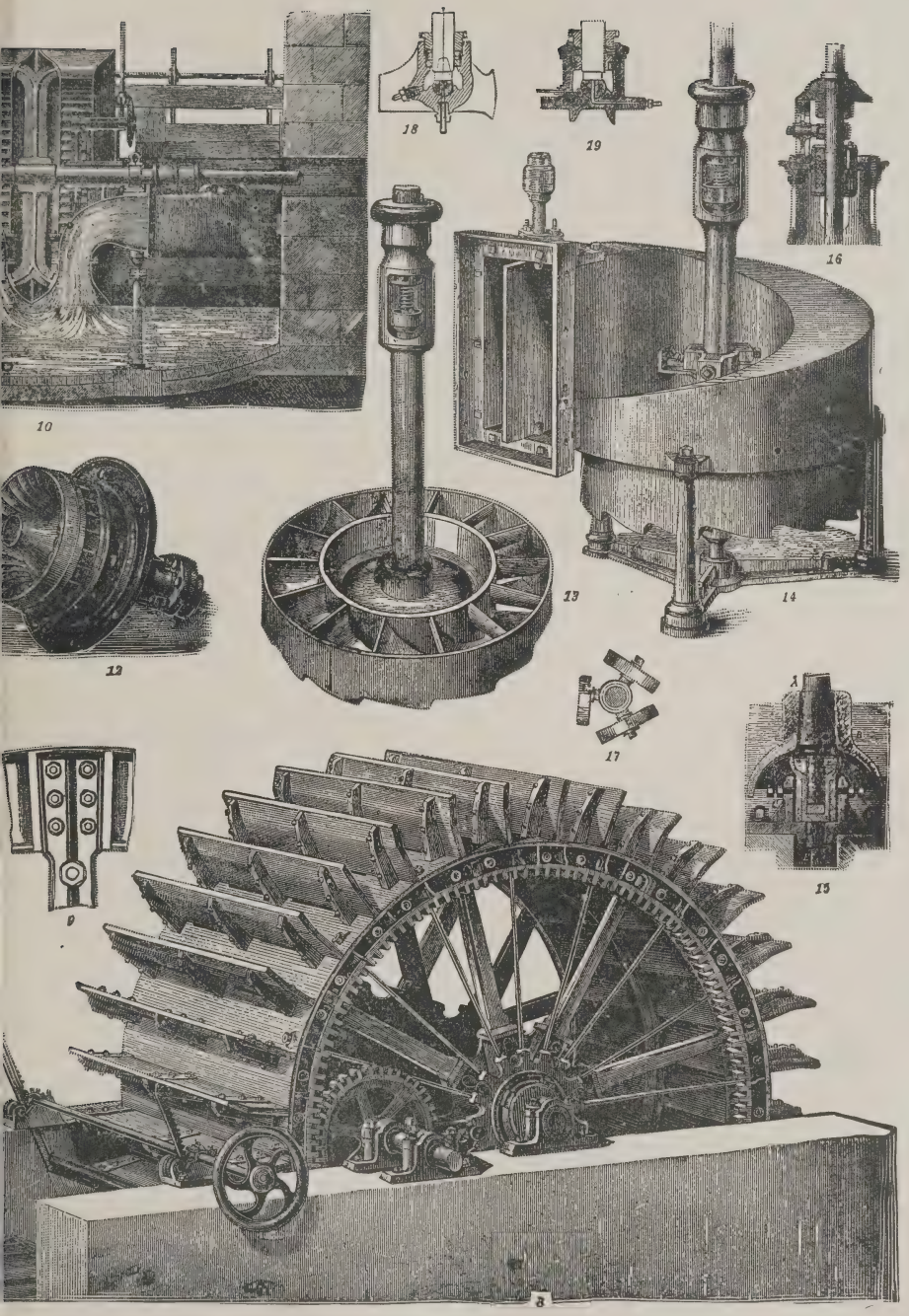
On the whole, it is generally thought better to apply the water at about 30° from the top of the wheel. In such high-breast or nearly overshot wheels, the water is let on to the buckets over the top of the sluice, which is made to open by lowering, and shut by lifting. In this way, however small may be the quantity of water, it is always applied at the highest possible level, which is of importance when it is its weight multiplied by the height of descent, not its impulse, that yields the effective power.

The structure of the overshot and breast wheel is nearly the same as that of the undershot, excepting in the substitution of curved or angular buckets, for straight floats; but even in the undershot wheel the floats are sometimes made with a slight curvature.

In any description of wheel, the motion may be taken off the axle by torsion, which necessarily requires rigidity in the arms; or it may be taken directly off the periphery, when the power is applied to a pinion working into segments, either external or internal, attached to the shrouding. In this arrangement there is no torsion of the axle, or transverse strain on the arms, and therefore the latter are more often made of round, wrought-iron rods, with a slight axle. This wheel is much lighter than with the massive axle and the strong wooden or cast-iron arms, and is called a *suspension* or *spider-wheel.*



WATER-WHEELS.—1. Overshot wheel. 2. Zuppinger's wheel. 3. Bucket-wheel with upp
wheel on Poncelet's plan. 7, 8. Construction of buckets for water-wheels, of cast
11. Leading-wheel. 12. Conicular wheel (Turbine). 13, 14. Stevenson's snail-shell



feed. 4. Center-feed wheel with trap. 5. Colladon's swimming-wheel. 6. Undershot
on, tin, or wood. 9. Joints of a cast-iron wheel. 10. Girard's double tangential wheel.
bine. 15–19. Details of a turbine wheel.

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In reckoning the power of water, its weight being 62½ lbs. to a cubic foot; theoretically 528 ft. falling vertically 1 ft. a minute, would be equal to 1 Boulton and Watt horse-power of 33,000 lbs. lifted 1 ft. a minute; but the effective power is far short of that, and 60 per cent of it, requiring 880 cubic ft., falling 1 ft. a minute, is generally reckoned a fair allowance for an effective horse-power. Seventy-five per cent, requiring 704 ft., falling 1 ft. a minute, is about the highest that has ever been spoken of, and it is doubtful whether any more than 75 per cent has ever been attained; while with low falls and imperfectly constructed wheels, it is often reckoned that a horse-power requires nearly 1000 cubic ft. a minute.

The velocity of the periphery of an undershot wheel is usually from 500 to 600 ft. a minute, and that of a bucket-wheel, overshot or breast, from 300 to 450 feet. It is seldom that the whole height of a fall can be advantageously made use of; for if the wheel be placed so low as to get the benefit of the whole height of the fall in low states of the water, very often it is liable in floods, to have the lower rim immersed, and to be obstructed or stopped by back-water.

The most extensive application of water-power in the world is the Niagara Falls power plant. For this installation the Niagara river was tapped about a mile above the falls by a canal 250 feet wide and an average depth of 12 feet. There are 10 inlets to the canal by which water is taken to the wheel pit. The latter is 178 feet deep and the tail-race connects with the river below the falls. The tail-race is a tunnel 7000 feet long and 21 feet by 18 feet at its largest section. The water from the canal drives twin turbines, which are a special design of what is known as the Fourneyron type, each pair of which develops 5000 horse power with a fall of 140 feet. Each pair of wheels is connected with a vertical hollow shaft 38 inches in diameter, but solid at the joints, where it is 11 inches in diameter. The upper end of these shaft carry the revolving fields of the large alternating current dynamo machine. The wheels discharge about 430 feet of water per second and revolve at the rate of 250 revolutions.

Turbines.—In the proper turbine (from Ital. *turbino*, a whirlwind), the water passes either, first, vertically down through the wheel between fixed screw blades, which give it a spiral motion, and then strikes similar blades attached to a movable spindle, but placed in the opposite direction, so that the impact of the water communicates a rotatory motion to the blades and spindle; or, second, a modification of the foregoing is to pass the water from the center horizontally outward through fixed curved blades, so as to give it a rotatory or tangential motion, and thereby cause it to act on the blades of the wheel which revolves outside.

In the reactionary wheel, which is in principle almost identical with Whitelaw and Stirret's wheel, previously described under the article BARKER'S MILL, the water is admitted at the center of the wheel from below, passes to the circumference between curved blades of the wheel, and escapes by tangential orifices at the circumference, there being valves made to open more or less, according to the quantity of water and to the power required.

The vortex wheel of Prof. Thomson takes in the water after descending through tubes, at the circumference, where, by means of fixed blades, it acquires a tangential motion, and then passes through between the curved arm of the wheel, and escapes at the center. As the two last described wheels work always under water, they are not liable to be obstructed by back-water, or to have their power lessened thereby more than what *is* due to the diminished fall, and they are understood to yield a good percentage of power, sometimes stated at 75 per cent; but all turbines are somewhat delicate, and liable to be choked by leaves or twigs, unless the water be carefully strained. Although only a few horizontal wheels have been described, their name is legion, and it would take a book to mention them all, or to describe their respective characteristics.

The reciprocatory hydraulic engine works exactly on the same principle as the ordinary non-condensing steam-engine. The water, under considerable pressure, is admitted at one end of a cylinder, the exit valve at that end being simultaneously closed, while it is shut off from the other end, and the exit valve there opened; and so the alternating action of the valves and of the piston goes on continuously. To work smoothly and effectively, the piston ought to be of large diameter, in proportion to the length of stroke, and to go slowly; otherwise the quick jerking is apt to shake and to injure the engine; and generally it is better to have two cylinders and pistons working together, as that enables them to work more equally, and to turn the crank without the use of a fly-wheel.

Both the turbine and the reciprocatory engine have been made use of as water meters.

The turbine and the reciprocatory engine have the advantage of being able to take the use of a fall much greater in height than the diameter of the largest wheel that can be made. See *Hydraulic Machinery*, by R. G. Blaine, and *Hydraulic Motors, Turbines, and Pressure Engines*, by G. R. Brodmer.

WATER-PROOFING. See INDIA-RUBBER. Besides the application of caoutchouc, peculiar methods have been employed to render cloth impervious to water, at the same time allowing the passage of air, the absence of this property in the impermeable caoutchouc manufactures having been found disadvantageous. Two plans are adopted for

water-proofing woolen cloths, without rendering them quite impervious to air—the air is to dip the cloth into a solution of soap, and thoroughly rub it into the texture, after which it is dipped into a solution of alum, a decomposition of the soap and alum is effected, and the minute openings between the fibers are in some way partly filled so as to exclude water. In the second plan, the cloth is dipped into a solution of gelatine or isinglass, and afterward in a solution of galls. A kind of tanning process is the result, the gelatine which has pervaded the cloth being rendered as insoluble as leather by its union with the tannin of the galls.

WATERSCAPE (also *seascape*) is an artist's term of somewhat recent origin, denoting a sea-view in contradistinction to a landscape.

WATER-SHED (Ger., *wasser*, "water," *scheiden*, "to separate"), is a range of high land lying between two basins, which distributes its waters to either side. The Rocky Mountains form the chief watershed of the United States, and four of our largest rivers —the Missouri, the Rio Grande the Colorado, and the Columbia—have their sources in this elevation.

WATER-SHIELD, *Brasenia peltata*, now classed with the water-lilies in the family *nymphæaceæ*. It has long, slender stems which arise from prostrate root-stocks. The oval leaves, having the slender petioles attached at the center, are from 2 to 4 in. long, and float on the surface of the water. The upper surface is green; the under surface and all the other parts, of a dull purple. The solitary flowers, on axillary peduncles, bloom at the surface, but soon become submerged. The calyx and corolla are each composed of four parts, with from 12 to 18 stamens, and from 4 to 18 pistils. The plant grows in water varying from 1 to 15 ft. deep. The only species known is that named above, which grows in ponds and slow streams from Canada to the gulf of Mexico along the northern border of Puget's sound, and in eastern India and Australia.

WATER-SPOUT. See WHIRLWINDS.

WATER-SUPPLY. Water is one of the primary wants of human life, no less essential than air and food; hence the strong and religious interest that has always been attached to the means of its supply. In the earliest records of civilization, we read of the digging of wells, and of quarrels about the possession of them. The "pools of Solomon," near Bethlehem, which remain now almost as perfect as when they were built, were connected with a scheme for supplying Jerusalem with water. In Assyria and Persia, from the earliest times, water has been conveyed to towns from astonishing distances in open channels or canals, and in subterranean tunnels, or *kanats*. In Egypt also, and in China, gigantic works for conveying water, both for domestic use and for irrigation, have been in existence from remote antiquity. Nor were these undertakings confined to the eastern hemisphere; we have evidence of the existence of kindred works in pre-Christian America. The ancient city of Mexico, which was built on several islands near the shore of the lake, was connected with the mainland by four great causeways or dikes, the remains of which still exist. One of these supported the wooden aqueduct of Chapoltepec, which was constructed by Montezuma, and destroyed by the Spaniards when they besieged the city. Hydraulic works on a great scale had also been executed by the Incas of Peru. Of all the ancient nations, the Romans paid the greatest attention to the supply of water, and carried the construction of *aqueducts* to the greatest perfection and magnificence. If we except the supply of New York from the Croton river (see AQUEDUCT), and that of Glasgow from loch Katrine, the efforts to supply modern cities are as yet insignificant compared with those of the Romans. The last-named works, finished in 1858, can convey 50,000,000 gallons a day a distance of 26 miles. It is only since the beginning of the sanitary movement, occasioned by the repeated visitations of cholera beginning with 1832, that the subject of water-supply, and more especially the *quality* of water-supply, has seriously occupied public attention. The result of every inquiry and every day's experience has been to bring out more strongly the decided effects on the health of a community arising from the quantity and quality of the water at their command; and as the river and surface sources of supply near the chief seats of population are becoming every year more contaminated by sewage (q.v.), the drainage from manured land, the droppings of animals, and the refuse of manufactures, enterprise and engineering skill must be directed either to procuring a supply of pure subterranean spring water from the chalk or other absorbent strata, or to bringing pure water from greater distances than hitherto. In 1867 a royal commission was appointed to inquire into the condition of the water-supply of London; and numerous schemes were laid before them. Mr. Bateman proposed to utilize the high drainage-grounds of north Wales, from which the river Severn is supplied, having an area of 204 sq. miles. The water was to be conveyed for the most part in an open aqueduct 173 m. long, and capable of carrying 230,000,000 of gallons a day, to service-reservoirs on the high land near Stanmore, about 10 m. from London (from which it was to be delivered, at high pressure, by means of pipes, to the whole city). The total cost was estimated at £11,400,023. On the ground of the distance, the committee reported against the proposal; as, on like grounds, they also did against a rival scheme for taking the supply from the lake districts of Cumberland and Westmoreland. Owing to the exceptionally great rain-fall in these regions (140 in. on an average), it is calculated that the two lakes of Ullswater and Haweswater, with a drainage of 100 sq.m., receive together an average daily discharge of 550,000,000 gallons. From this water it was proposed to supply not

only the metropolis, but the principal towns of the n.w. of England; but from various causes the scheme was abandoned. A bill has lately passed both houses of parliament to supply Manchester with water from Thirlmere. The Thames water has in some respects a superiority over the soft waters usually obtained from high gathering-grounds. It is well aërated, and keeps well. Recently, a covered conduit, 80 m. long, has been constructed, which conveys 8,000,000 gallons of pure chalk spring-water from the sources of the Dhuis, in Champagne, to Paris; and operations are about complete to bring the chalk springs of the Vanne, calculated to yield 22,000,000 gallons a day, also to Paris, a distance of 104 miles.

The chief points of interest on this subject may be arranged under the heads of the sources of supply, the qualities of water, and the arrangements for its conveyance and distribution.

Sources of Water.

The ultimate source of all *fresh* water is rain (q.v.). When it has fallen on the earth, it presents itself chiefly in the forms of surface-water, rivers, and springs.

Surface-collection.—Rain-water, as it is formed in the upper regions of the atmosphere, is the purest that nature supplies; but in descending, it brings with it whatever impurities are floating near the surface, which, in the neighborhood of towns, are numerous, consisting of various gases, together with soot and other floating particles, organic and inorganic. Rain-water has a strong affinity for organic impurities—that is, the corrupting ingredients derived from vegetable and animal bodies, and which are diffused over every surface in the vicinity of living beings; hence, when collected from the roofs of houses, it has a tendency to rapid putrefaction. Being free from saline ingredients, it is excellent for washing, but is not generally pleasant to drink.

But if we resort to a barren district of rock, destitute of vegetation, and remote from the pollution of towns, we may obtain water with comparatively little organic impurity. Notwithstanding several defects, it happens in various places that a surface-supply is the best that can be had.

Rivers.—The water obtained from running streams is in part what has flowed immediately from the surface, and in part the water of springs, shallow or deep. In any case, a considerable amount of contact with the ground has taken place, and in consequence saline and organic matter is liable to be dissolved in a greater or less degree. The extent of the impregnation, as well as the kind of material dissolved, will depend on the rocks and strata of the river-basin.

River-waters, besides the qualities they derive from their primitive sources, are apt to contain mud, decayed leaves, the exuviæ of fish, and other matters in suspension, and are thus deficient in the clearness and transparency so essential to the satisfaction of the eye in a drinking-water. Moreover, the water partakes of the extremes of summer and winter temperature. But the great objection to water from rivers is their general pollution from the manure used upon the land, sewage, and manufactures, so that there are now few rivers left from whose lower course a supply could be taken for domestic purposes. On the other hand, the supply from one of our large rivers is boundless and unfailing; and it conveys the surface-drainage and spring effusions of a large tract of country, without incurring any trouble or expense as to the original sources. Rivers that issue from lakes are generally the purest, as the suspended matter has time to be precipitated.

Springs.—The qualities that recommend water to the eye and to the palate belong in a pre-eminent degree to spring-water (see Spring): it is clear, sparkling, and of an agreeable and uniform temperature at all seasons of the year (about 50° Fahr.); it is well aërated, and is totally free from the offensive taint so common in all other waters, as well as devoid of the animalcules generated by organic impurity; and where a sufficient number of springs can be collected to suffice for a town, it is the most desirable of all sources of supply. About a quarter of the water brought to Edinburgh is spring-water collected on the slopes of the Pentlands.

Quality of Water.

Perfectly pure water is hardly to be found; rain-water, and even artificially distilled water, are only approximates. The chief impurities may be considered under the heads of mineral matter in supension, mineral matter in solution, and organic matter.

Mineral Matter in Suspension.—When running water comes upon a loose bottom, it carries the finer particles of sand and earth along with it. If the water comes into a position of perfect stillness, the matters thus floated gradually sink to the bottom again. Particles of clay, owing either to their excessive fineness or to their adhesive attraction for water, subside very slowly, and impurities of this nature are not easily remedied. Besides earthy matter, compounds of iron and lead are also in some circumstances present in a solid state, and may be got rid of by filtering. To separate clay-powder from water, the practice has long been resorted to in India and China of putting in a piece of alum, which seems to produce a kind of coagulation.

Dissolved Mineral Matter.—Spring-water, which is generally clear and sparkling, holding no solid matter in suspension, is seldom without a large amount of dissolved mineral matter, sometimes as much as 2 parts in 1000, commonly from 1 in 1000 to 1 in

20,000. River and surface water also contains more or less dissolved minerals (see AERATED WATERS). The great bulk of the solid matter held in solution in ordinary waters consists of the salts of soda, potash, lime, and magnesia. The most material are the salts of lime and magnesia, as they are the causes of what is called "hardness" in water, which we shall speak of more particularly afterward. The most important salt of lime is the soluble hydric carbonate formerly known as *bicarbonate*, which is derived from chalk or limestone. Chalk or limestone is a *carbonate* of lime (otherwise *calcic carbonate*)—that is, a compound of lime with one equivalent of carbonic acid (carbonic dioxide)—and is almost insoluble in water; but when water containing an excess of carbonic acid—as is the case with spring-water especially—passes over limestone, it gives the carbonate a double dose of carbonic acid, and converts it into bicarbonate, which is soluble. The waters having bicarbonate of lime for their chief impurity are familiarly spoken of as the chalk-waters. The other salt of lime often present in water is the *sulphate* or *gypsum*. The important distinction between the bicarbonate and the sulphate lies in the fact, that the first, the bicarbonate, may be in great part precipitated, or thrown down in a solid form, by boiling, which drives off the solvent carbonic acid; whereas the second, the sulphate, cannot be so precipitated. The chief effect of the boiling takes place in the first five minutes.

Apart from its hardness, it has been made a question whether water containing salts of lime is injurious or not to the human constitution. Dr. Lankester holds that there is evidence to prove that carbonate of lime in large quantity is positively injurious; and most physiologists are agreed that pure water is the best for securing the health of animals and man.

With regard to magnesia, its salts are well known to act as powerful medicines when taken in large doses, and it may be presumed are not altogether without effect in the small quantities existing in ordinary magnesian waters. A foreign physician has lately made the observation, that magnesia is the characteristic ingredients of water in the districts where the diseases called *cretinism* and *goiter* abound.—Of salts of *soda* and *potash*, the principal is common salt, or the chloride of sodium. Sodic sulphate (Glauber's salt) occurs along with the chloride in the salt-springs of watering-places as well as in the sea-waters. None of all these salts have any effect on the hardness. In the case of sea-water, which is very hard, the effect is not due to common salt, but to the lime and magnesian salts dissolved in it; were it not for these, sea-water would be perfectly suitable for washing, although not for drinking.—Salts of *iron* in considerable quantity make what are called technically named *chalybeate* waters, which belong to the medicinal class. When the iron exists in the spring as carbonate, which is the most usual case, on exposure to the air it is changed into the peroxide, and falls down in the form of an ochery precipitate. Salts of iron give an inky taste to the water, and a yellowish tint to linen washed in it.

Hardness in Water.—The quality of hardness in water is commonly recognized by the difficulty experienced in washing, and by the amount of soap necessary to form a lather. This quality is injurious also in the preparation of food; but its action is most universally felt in washing operations. It occasions the chapping of the skin, an enormous waste of soap, an extra labor, and a corresponding tear and wear of clothes. Every grain of chalk contained in water decomposes 10 grains of soap; and thus the hardening matter contained in 100 gallons of water, such as is supplied to London, will destroy 35 oz. of soap—that is, the first 35 oz. of soap added to this quantity of the water will disappear without forming any lather, or having any cleansing effect. Soap is a compound, formed of an alkali (soda or potash) joined to an oily acid. When a salt of lime, then, is present in the water, the lime decomposes the soap, and combines with the oily acid to form a lime-soap, which is insoluble, and has no detergent properties.

The most usual hardening ingredients are the salts of lime. Salts of magnesia and of iron are also hardening salts. Salts of soda and potash have no hardening effect. Dr. Clark, formerly professor of chemistry in Marischal college, Aberdeen, has devised a scale of hardness which is now universally employed in the chemical description of waters. The hardening effect that would be produced by one grain of chalk dissolved in a gallon of water is one degree of hardness; in like manner, four grains per gallon would produce four degrees of hardness; ten grains, ten degrees; and so on. The degrees are expressed in numbers—thus, 1°, 4°, 10°, 15°, are one, four, ten, fifteen degrees respectively. The degree of hardness of any particular water can be readily and exactly determined by Dr. Clark's soap test (q.v.).

Next to washing, the deleterious consequences of hardness are felt in various culinary operations, especially in the furring of boilers and cooking utensils, and in the infusion of tea. It is a fact of universal experience that hard water requires more tea than soft water to make an infusion of the same strength, and also renders the infusion muddy. Subcarbonate of soda in crystals, by decomposing the earthy salts, improves the water; but if more is added than what will exactly decompose the earthy salts present, it injures the fine flavor of the tea. It may be stated generally, that for the purposes of washing and cooking, a water of less than 6° is soft, but above this point the hardness becomes objectionable. At 8°, the water is moderately hard; at 12°, it is very hard; at 16°, the hardness is excessive; and much above this, it is intolerable.

To make these observations more intelligible we may mention a few instances of

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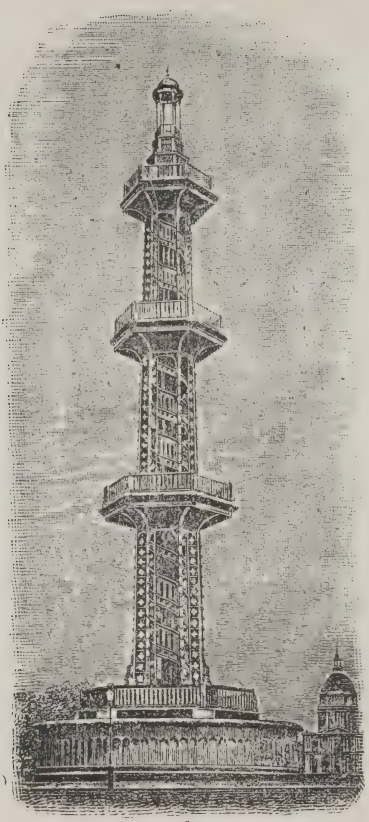
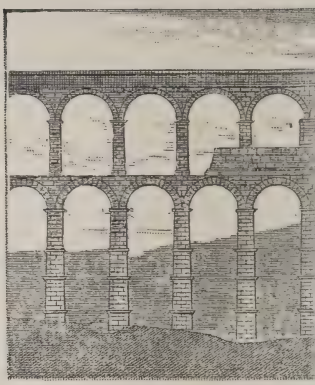
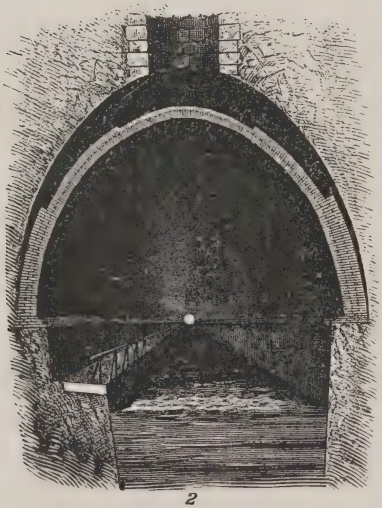
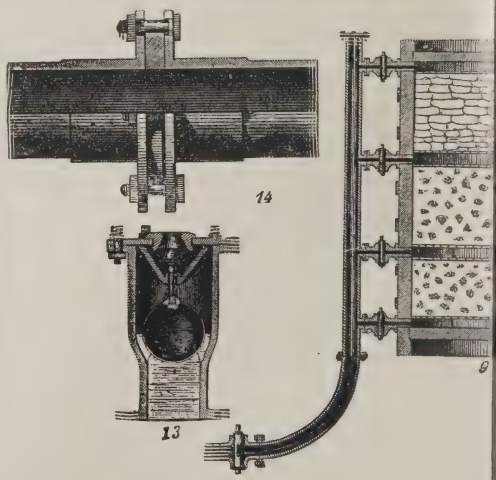
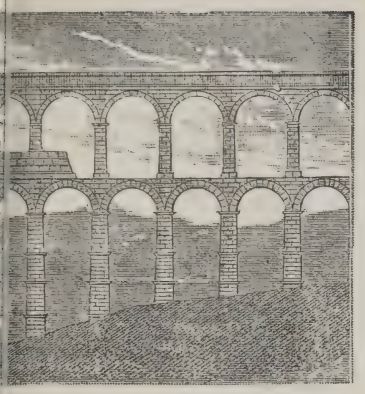








WATER STORAGE, ETC.—1. High-service tower. 2. Subterranean canal. 3. Tower of a
6. Apparatus for regulating a drain-pipe. 7. Siphon-drain. 8. Automatic sluice-g
chamber.



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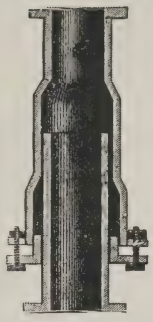

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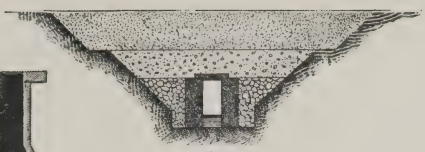

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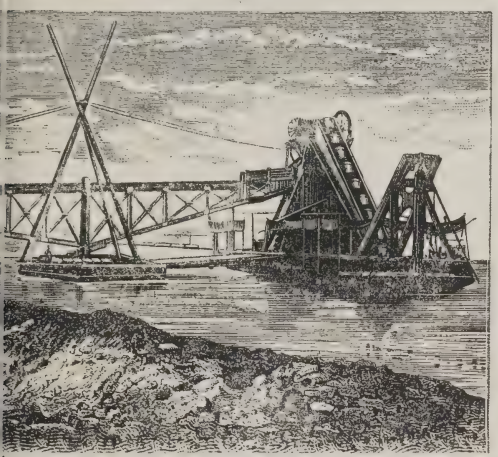

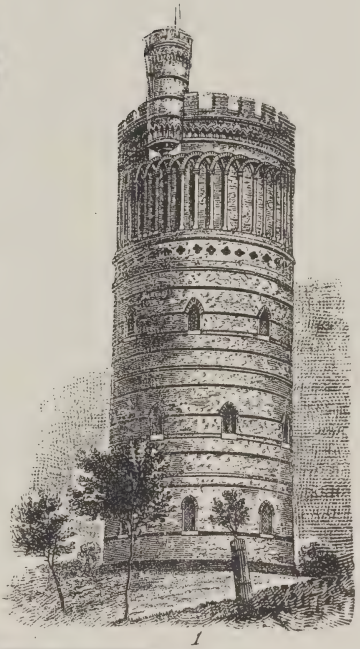

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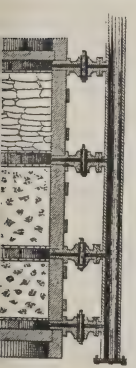

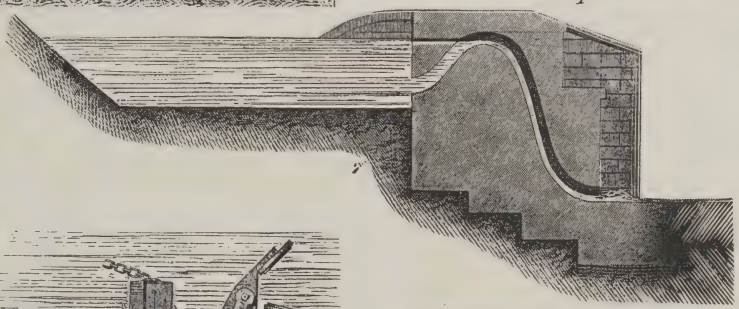

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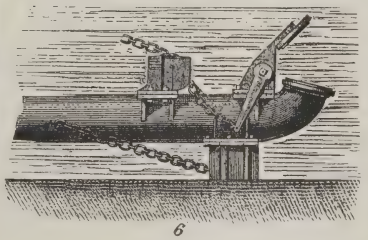

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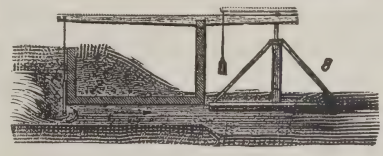

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rtesian well at Paris. 4. Aqueduct at Vulci (Etruria). 5. Dredging in the Suez Canal. 9, 10. Water-filters. 11. Wooden conduit-pipe. 12, 14. Iron conduit-pipes. 13. Air-

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known waters, with their place in the scale. In Keswick the water is under half a degree of hardness; in Lancaster it is 1½°; and in Manchester, 2°. The water of the Dee at Aberdeen, which is used for the supply of the town, is 1¼° of hardness. The water of loch Katrine is of great purity, having only two grains of solid matter of all kinds in the gallon, and 1° of hardness. The waters of the Welsh mountains, from which it has been proposed to supply London, have on an average less than 2°. The river Clyde, which formerly supplied Glasgow, is 4½°, and may also be reckoned a soft water. The Thames at London, as well as the New river, is about 14°, while many of the tributaries of the Thames rise as high as 16°; but being all chalk-waters, they may be materially softened by boiling. Springs from the chalk commonly range from 16° to 18°; but particular springs are to be met with in some parts of the world four or five times as hard, from the presence of bicarbonate of lime. The water of the treasury pump in London has from 50° to 60° of hardness. In many parts of the continent hard waters abound; but the testing of waters has not been so much attended to there as in this country.

The evidence laid before the royal commission above referred to went to prove that there is no reason whatever to suppose that the hardness of the Thames water, which averages about 15°, would be in the least degree prejudicial to health. It appears that the hardness of springs is generally considerable; and that surface-waters may be collected in a state that is to be considered soft (4°.94).

Lead in Water.—Injurious effects have frequently arisen from the contamination of water with lead, derived from leaden pipes and cisterns. Some kinds of water are known to act powerfully on a leaden surface, and others scarcely at all; but the qualities and circumstances on which the action depends have never been satisfactorily determined. Distilled water, and soft lake and river waters in general, act most decidedly, but by no means in proportion to their softness. The presence of air in the water seems one essential condition; light also increases the action, as does the presence of vegetable matter; it has been observed that when leaves drop by chance into a lead cistern, the spots where they lie become visibly corroded. The water of loch Katrine, according to extensive sets of expriments by distinguished chemists, is allowed to have an intense action* on lead under certain circumstances—viz., "1st, If the lead be bright and highly polished; and 2d, If the lead and water be freely exposed to the access of air." But it "does not exert any noxious action on lead when the metal is in its ordinarily dull state." The coating formed on the surface of the metal is held to protect it from further chemical action. Still there are opposing facts to show that this protective action is not always to be relied on; and that water that has passed through any considerable length of lead pipe, or stood for some time in a short one, or in a cistern, should never be used without care; a ninth part of a grain of lead per gallon has been known to derange the health of a whole community. Dr. Clark made the unexpected discovery that sand-filters completely separate the lead.

Organic Impurities.—The contamination of water by vegetable and animal substances takes place in various ways. The most obvious and abundant source of this class of ingredients is the sewage and refuse of towns; and next in order may be ranked the contact with soils rich in organic matter. Among organic impurities may be classed offensive gases, such as carbureted, sulphureted, and phosphureted hydrogen; vegetable fibers in a state of rottenness; putrefying products of the vegetable or animal kingdoms; starch, muscular fiber, etc.; urea and ammoniacal products; vegetable forms—algæ, confervæ, fungi, etc.; animalcules—infusoria, entomostraceæ, annelidæ or worms, etc. Water falling on a growing soil, and running off the surface to lie in stagnant ponds, is in very favorable circumstances for being tainted with vegetable and animal life. Water-plants will spring up and feed numerous tribes of animalcules, and each pool will be a constant scene of vitality. In such a state the water is usually unfit for drinking; the palate instantly discerns a disagreeable taint, and no one will use it who can do better. The surface-water of a district overgrown with peat-moss has usually a peaty flavor, as well as a dark and dirty color. The infusion of peat does not breed animalcules, being a strong antiseptic; but it is an objectionable ingredient nevertheless. Very slow filtration has been found to remove the color of the infusion in some degree, but not entirely. Lime removes the peat most effectually, but there is both expense and risk in applying it. It is perhaps doubtful whether any specific unwholesomeness can be justly attributed to peat-water; but it is unpalatable, and the use of it is shunned by the inhabitants of peaty districts, and even by cattle. The presence of peat in the lands used as collecting-grounds for surface-water—and it is generally such worthless tracts that are so employed—is a disadvantage attending that mode of supply.

Chalk-water, which, as it issues from a spring, is perfectly free from organic matter, has a source of contamination within itself. When exposed to light and air, the duplicate dose of carbonic acid that keeps the chalk dissolved, becomes decomposed; and the carbon of the decomposed acid gives rise to a green vegetation, which soon acquires an offensive marshy smell.

Organic matter in a putrefying state forms the worst kind of contamination that

* The water of loch Katrine is remarkably well aerated, having 7¼ cubic in. of air per gallon, of which 2½ in. are oxygen. Dr. Clark had a suspicion that the oxygen may turn out to be in some different state or modification from common oxygen.

water can have. Though we may not know the precise effects of these impurities on the animal system, the single fact of their rendering the water repulsive to the taste and nauseous to the stomach would be sufficient to condemn their use. What is disagreeable to the senses, must be presumed to be unwholesome in addition, until the contrary is proved. Though no one has ever yet gone the length of maintaining, as a general truth, the wholesomeness of water abounding in vegetation, insects, and decaying matter, yet the water of the Thames, even within the influence of the tides, where it is contaminated by the whole sewage of the metropolis, found defenders until lately, on the plea that the amount of impurity was too small to do harm. This ground is at length given up; but Thames water above Teddington lock is still sanctioned as safe water for the companies to supply to the inhabitants of London, notwithstanding the sewage of the numerous populous towns that the river receives above that point. As to this plea of smallness of amount, the highest medical authorities hold that it is impossible to say how small a quantity of organic matter in a state of fermentation may not do harm. We are not, however, left merely to presume that organic impurity in water is prejudicial to health. During the cholera visitation of 1853–54, a gigantic experiment was undesignedly made on half a million of human beings. It so happened that a certain district of London was supplied by two rival water-companies, the two mains running often side by side, and some houses taking water from the one, and some from the other. The whole inhabitants were living alike in all respects save one—viz., that one company drew its water from high up the Thames, where it was of comparative excellence, while the other drew its water from low down the river, where it was profusely contaminated with town-drainage. Among this population, there were more than 4,000 deaths from cholera; and when the epidemic had subsided, an inquiry was made, house by house, as to those deaths, and as to the water-supply of the several houses where they had occurred. The inquiry was conducted with every precaution, to avoid sources of fallacy; and the result was this: in the one set of houses, the mortality per 10,000 of the population was 37; in the other set of houses it was 130—that is to say, the cholera death-rate was 3½ times as great in the one set as in the other.

It is a common notion that *every drop of water teems with life;* but this is a mistake. Deep wells, and spring-water in general, contain little or no living organic matter. Consequently, it is quite possible to obtain a liquid perfectly free from animalcules and vegetation. The presence of living creatures, vegetable or animal, discernible either by the naked eye or by the microscope, is a proof of organic taint in the water, and is one of the tests of this kind of impurity. With respect to rain-water, Dr. Hassall states, in his evidence before the general board of health: "I have made several examinations of rain-water immediately after its dissent to the earth, obtained in both town and country, and can confidently assert that it does not, in general, contain any form of living vegetable or animal matter." The conditions necessary for the development of vegetation and animalcules over and above the presence of matter for them to feed on, are *air*, *light*, and *stillness*. With regard to the probable effects on health of living creatures contained in water, Dr. Hassall's observations are worthy of attention: "All living matter contained in water used for drink, since it is in no way necessary to it, and is not present in the purest waters, is to be regarded as so much contamination and impurity—is therefore more or less injurious, and is consequently to be avoided. There is yet another view to be taken of the presence of these creatures in water—viz., that where not injurious themselves, they are yet to be regarded as tests of the impurity of the water in which they are found."

Means of purifying Water.

The mechanical impurities of water, or the solid particles rendering it muddy or milky, may in most cases be removed by mechanical means. The two processes for this purpose are *subsidence* and *filtration*. The effects of subsidence are strikingly seen in the case of rivers that pass through lakes. See GENEVA, LAKE OF. The subsidence of solid particles depends on their own weight, as compared with the weight of an equal bulk of water. To favor the process, the most perfect stillness should be allowed. It is expedient to have partitions placed in the subsiding reservoirs at short intervals, more effectually to prevent the agitation of the water. The water should be run off from the top, and not from the bottom. By making the bottom of the subsiding reservoir form a declivity from opposites sides, and providing means to let off the water occasionally from its lowest depth, it is possible to get quit of the subsided mud. It is always found of advantage in clearing water from solid particles, whether by subsidence or by filtration, to mix together streams of different qualities.

In constructing an artificial filter on a large scale, a basin is formed, having the floor nearly level, but slightly inclining toward a center line, and made water tight by puddling the bottom and sides with clay. On the floor is laid a series of layers of gravel, coarse at first, and getting gradually finer upward; next, a layer of slate-chips or seashells, then one of coarse sand, on which is placed the actual filtering layer of fine sand. The depth of this layer is from twelve to thirty inches, that of the entire mass from four to six feet. The water being admitted gently on the top of the sand, sinks down and is conducted by a series of channels, generally of tile-pipes, into the main drain. A filter in a clean state will pass from twelve to eighteen vertical feet of water in twenty-four

hours. The solid matter intercepted does not penetrate more than three-fourths of an inch into the sand, so that, by removing a very thin film from the surface, the filter is again clean. What is scraped off the top, is capable of being washed and put again to use. "This process of filtration," says prof. Clark, is "efficacious in removing mechanical impurities to an extent that could scarcely be believed without seeing the process."

The cleansing power of sand can hardly be accounted for on the theory of mere mechanical interception. Though there is no chemical action, strictly speaking there is no doubt that the attraction of adhesion is at work—a power that plays a greater part in natural processes than has generally been assigned to it. Some substances manifest this adhesive attraction more strongly than sand, and have therefore still greater efficacy as filters; though practically, and on the large scale, sand is the most eligible. Powdered charcoal has long been known as a powerful filtering medium, attracting and detaining especially organic matter. Animal charcoal, or that derived from burning bones, is still more efficacious than wood charcoal. A filter of animal charcoal will render London porter almost colorless.

According to recent researches, it would seem that loam and clay have similar properties, and may be made available as filters. Professor Way states that "they have powers of chemical action for the removal of organic and inorganic matters from water to an extent never before suspected." The filthiest liquids, such as putrid urine and sewer-water, when passed through clay, dropped from the filter colorless and inoffensive. The clay used was that known as pipe-clay.

For filters for domestic use, see FILTER.

Softening of Water rendered Hard by Chalk—Clark's Process.—This is one of the most beautiful applications of science to the arts of life that could perhaps be named. We extract the inventor's own account of it (retaining the old nomenclature) as read at the meeting of the society of arts:

"In order to explain how the invention operates, it will be necessary to glance at the chemical composition and some of the chemical properties of chalk; for while chalk makes up the great bulk of the matter to be separated, chalk also contains the ingredient that brings about the separation. The invention is a chemical one for expelling chalk by chalk. Chalk, then, consists, for every 1 lb. of 16 oz., of lime, 9 oz.; carbonic acid, 7 oz.

"The 9 oz. of lime may be obtained apart, by burning the chalk, as in a lime-kiln. The 9 oz. of burnt lime may be dissolved into any quantity of water not less than 40 gallons. The solution would be called lime-water. During the burning of the chalk to convert it into lime, the 7 oz. of carbonic acid are driven off. This acid, when uncombined, is naturally volatile and mild; it is the same substance that forms what has been called soda-water, when dissolved in water under pressure.

"Now, so very sparingly soluble in water is chalk by itself, that probably upward of 5,000 gallons would be necessary to dissolve 1 lb. of 16 oz.; but by combining 1 lb. of chalk in water with 7 oz. addititional of carbonic acid—that is to say, with as much more carbonic acid as the chalk itself contains—the chalk becomes readily soluble in water, and when so dissolved, is called bicarbonate of lime. If the quantity of water containing the 1 lb. of chalk with 7 oz. additional of carbonic acid, were 400 gallons, the solution would be water of the same hardness as well-water from the chalk-strata, and not sensibly different in other respects.

"Thus it appears that 1 lb. of chalk, scarcely soluble at all in water, may be rendered soluble in it by either of two distinct chemical changes—soluble by being deprived entirely of its carbonic acid, when it forms lime-water, and soluble by combining with a second dose of carbonic acid, making up bicarbonate of lime.

"Now, if a solution of the 9 oz. of burnt lime, forming lime-water, and another solution of the 1 lb. of chalk and the 7 oz. of carbonic acid, forming bicarbonate of lime, be mixed together, they will so act upon each other as to restore the 2 lbs. of chalk, which will, after the mixture, subside, leaving a bright water above. This water will be free from bicarbonate of lime, free from burnt lime, and free from chalk, except a very little, which we keep out of account at present for the sake of simplicity in this explanation The following table will show what occurs when this mutual action takes place:

AGENTS.		PRODUCTS.	
Bicarbonate of lime in 400 gallons.....	Chalk.....16 oz. with Carbonic acid 7 oz.	= 16 oz. of chalk	= 2 lbs.
Burnt lime in 40 gallons of lime-water.....	.....9 oz.	= 16 oz. of chalk	

"A small residuum of chalk always remains not separated by the process. Of 17½ grains, for instance, contained in a gallon of water, only 16 grains would be deposited, and 1½ grains would remain. In other words, water with 17½° of hardness, arising from chalk, can be reduced to 1½°, but not lower.

"These explanations will make it easy to comprehend the successive parts of the softening process.

"Supposing it was a moderate quantity of well-water from the chalk-strata around the metropolis that we had to soften, say 400 gallons. This quantity, as has already been

explained, would contain 1 lb. of chalk, and would fill a vessel 4 ft. square by 4 ft. deep.

"We would take 9 oz. of burnt lime, made from soft upper chalk; we first slack it into a hydrate, by adding a little water. When this is done, we would put the slacked lime into the vessel where we intend to soften; then gradually add some of the water in order to form lime-water. For this purpose, at least 40 gallons are necessary, but we may add water gradually till we have added thrice as much as this; afterward, we may add the water more freely, taking care to mix intimately the water and the lime-water, or lime. Or we might previously form saturated lime-water, which is very easy to form, and then make use of this lime-water instead of lime, putting in the lime-water first, and adding the water to be softened. The proportion in this case would be one bulk of lime-water to ten bulks of the hard water."

It is of importance that the lime-water—that is, the softening ingredient—be put into the vessel first, and the hard water gradually added, because there is thus an excess of lime present up to the very close of the process. Instead of lime-water, the lime itself may be put at once into the vessel, and some of the water to be softened gradually added to dissolve it. The softened water thus obtained has no action on lead pipes or cisterns, as many soft waters have. One ton of burned lime, used for softening, will produce three and a half tons of precipitate. The present water-supply of the metropolis, if subjected to Clark's process, would deposit about fifty tons of chalk daily.

The process is and has been in successful use on a large scale at various works constructed under the direction of Mr. Homersham, C.E., London, some of them 20 to 25 years since, and others more recently, for softening spring water derived from the chalk, the oolitic, the lower greensand, and other geological formations, for the supply of Aylesbury, Aston, Clinton, and Mentmore in Bucks; the city of Canterbury with its suburbs, and Herbert hospital, in Kent; Castle Howard in Yorkshire, Caterham, Godstone, Nutfield, Redhill, and Warlingham in Surrey; Park Place Henley in Oxfordshire; Tring in Herts. Works have also been more recently constructed for supplying softened spring-water to Sandringham, Norfolk, the seat of his royal highness the prince of Wales, and to Bushey and Stanmore, Middlesex.

The process should always be carried out in suitable covered reservoirs, and is then found to be as conveniently applicable, and even more so, for softening large as small quantities; and spring-water varying from 18 to 20 degrees of hardness by Clark's scale is thus readily softened down and supplied to the consumers at from 2½ to 4½ degrees of hardness. The process for several years past has been in use at Sandhurst, 105 m. n.w. of Melbourne, in Australia, for lessening the amount of organic matter always found to exist in surface-water impounded in large open reservoirs or artificial lakes, and for this purpose is very superior to filtration through sand. Indeed, in the warm climate at Sandhurst, the amount of organic matter becomes so great as to plug up the pores of the sand, and render filtration impracticable.

Natural Process of Purification from Organic Matter.—Although, by means of sand and other filters, or of the liming process, organic contamination of water may be much reduced, there still remains enough to render the water unsafe for use. Is water, then, once corrupted with organic matter, hopelessly and permanently so? This question can be answered in the negative. Filthy water has a tendency to purify itself, and this in two ways. In the first place, in any shallow stream of polluted water, such as the kennels of a street, there may be observed long brushes of a sort of slimy vegetation adhering to every projection of the bottom. All this matter has been disengaged from the water, which thus flows away so much the purer. The second and most effective part of the natural purification consists in the actual decomposition of the impurities. The nitrogen of the decaying matter, then, goes to form nitric acid, which, uniting with bases, forms salts of the class called *nitrates*, of which salpeter is one. Thus, what was in a state of putrefactive change, offensive to the senses, breeding loathsome insects, and causing dangerous disorders, is changed in course of time into a stable and harmless product. This process is constantly going on in rivers and other waters containing organic matter. In the case of streams passing through populous districts, the contamination goes on at a rate far beyond the power of natural purification; but we can easily conceive how a river, very much contaminated with organic impurities at one part of its course, may, after flowing a long way through an uninhabited tract, be almost restored to its natural state. The process is one of oxidation, and takes place at the expense of the free oxygen, of which, in healthy, normal water, there ought to be 29 per cent of the entire volume of gases held in solution.

The oxidation is much favored and hastened when the water percolates or filters very slowly through porous beds of earth. If the filtration has been sufficiently prolonged to convert all the decaying matter into carbonic acid or nitrates, the water will be pure, as far as the organic taint and the presence of animalcules are concerned, and will, in fact, be neither disagreeable nor unwholesome, the amount of the dissolved carbonates or nitrates being unimportant.

Dr. Smith has proved by direct experiment that decomposing organic matter passed through a filtering-bed is changed into nitric acid. "A jar, open at both ends, such as is used with an air-pump, was filled with sand, and some putrid yeast, which contained no nitric acid, was mixed with pure water, and poured on the sand, and allowed

to filter through. The production of nitric acid was abundant." It is not improbable that other earthy matters, such as loam and clay, may have a still more decided influence in hastening the formation of the nitrates; and perhaps by imitating more closely the slow mode of filtration by which nature converts surface-water into spring-water, it may yet be practicable to make the most contaminated waters fit for use.

Conveyance, Storage, and Distribution.

Into the engineering operations connected with the conveyance of water from its source to the town to be supplied, we need not enter, beyond noticing that when the source is below the level of the houses, steam or other power is necessary to lift or propel the water to the necessary height; while in the more general and more desirable case of the source being higher than the place where the supply is to be delivered, the water is made to flow by its own gravitation, either in a channel or culvert with a continuous descent, as in the ancient aqueduct (q.v.), or in the simpler and more economical modern plan of a line of cast-iron pipes following the inequalities of the surface. In many cases, both principles are employed, the water flowing for the most part in a gently-sloping conduit, tunneled through hills where nccessary, and being carried through valleys in tubes decending and ascending—an inverted siphon, as it is called. The Croton aqueduct, which supplies New York, is carried across the Manhattan valley, upward of 100 ft. deep, in this way. The Glasgow supply from loch Katrine flows mainly in a sloping channel carried through tunnels and over bridges; but there are four miles of iron pipings across valleys.

The extent of the storage in reservoirs depends on the nature of the supply. If water is derived from perennial springs, whose minimum flow equals the maximum demand, the storage may be the least possible. If a river is the source, the reservoirs should be large enough to hold such a stock as will carry the consumers over the periods when the river is polluted by rains; they should also be large, on the principle of allowing time for purification by subsidence, especially if artificial filtration be not employed. In places where the supply is obtained from surface drainage, or from a small stream, the practice is to build reservoirs capable of containing a five or six months' supply, it being necessary to provide against the greatest droughts that ever happen in any season.

The reservoirs should be deep, so as to prevent vegetation, and the distributing or service reservoirs should be roofed.

In distributing water over a town, two different methods have been adopted, known respectively as the *intermittent* and the *constant* systems of supply. On the intermittent system, water is laid on once a day, or once in two or three days, as the case may be, and fills a tank attached to every separate house, and from this tank the water is drawn off as required. The feeding-pipe of such a tank or cistern is provided with a ball-cock which ingeniously shuts off or admits the supply, as the cistern may be full or empty. On the constant system, no tank is absolutely needed, but the house-pipes are kept constantly charged through their unbroken connection with the distributing reservoir, which must therefore be higher than the highest house to be served. The intermittent supply was until lately employed everywhere in the metropolis; but it is universally admitted that the other system is vastly superior in every respect. The disadvantages of the intermittent practice have been strongly set forth in all the recent official reports on sanitary improvement; the expense of the erection and repair of cisterns, the trouble requisite to keep them clean, the contamination of the water by the neighborhood of sources of pollution, the frequent waste of water that occurs, the difficulties imposed on the poorer class of tenements where cisterns are not provided—are a few of the objections urged against this mode of supply. In a letter in the *Times*, January 3, 1866, Dr. H. Jeaffreson thus describes the condition, in regard to water-supply, of the centers of typhus infection in Lambeth, Southwark, Bethnalgreen, etc.: "Those houses the best supplied have each a butt, holding about 80 gallons, into which water flows from a stand-pipe for from ten minutes to half an hour each day, and is supposed to supply the wants of 20 persons for cooking, the washing of their persons, house, and linen, and for the rinsing down of the water-closets at such times as it may suit the caprice of any one of the inmates."

One important advantage, arising from the constant system, is the ease with which water can be had in time of fires. The water being supplied at high-pressure, all that is necessary is to affix a hose to the water-plug in the street, when a jet corresponding in height to the pressure is obtained, which can be immediate directed against the fire.

Cisterns, pipes.—Owing to the action of water on lead, already described, it is desirable to avoid the use of that metal in connection with very soft lake or river water. With regard to lead *pipes*, if the precaution is taken when the water has stood for any time in them, of allowing the first portions to run off before any is taken for use, little danger can arise; but either lead *cisterns* should be wholly avoided, or means taken to ascertain whether they contaminate the water; and if so, a remedy should be applied. There are various substitutes for lead as a lining for cisterns. Slate slabs are highly recommended. Gutta-percha is also found to be an easily fitted, cheap, and durable lining. For a few

days, the water tastes of the naphtha used in applying the lining; but afterward, no kind of water, not even acids, have any action on the gutta-percha. Pipes of gutta-percha may also be used; they are cheap, and easily fitted up.

Common-wells.—The simplest of all water-supplies is that of a cottage or farmhouse in the country, with a good spring rising to the surface close by; and yet what a poor use is usually made of such a precious boon! The country well is generally a simple cavity to receive the spring, rudely lined, it may be, with stones, but with open mouth, into which dust and dead leaves are blown by every wind, and foul surface-water is trickling from all sides. Being exposed to the light, there is generally a profuse vegetation on the bottom and sides, and, in addition to these impurities, it is further muddied by the dipping in of buckets, often dirty on the outside. Who has not been disgusted, when asking a drink at a cottage, to get water thick with dust and visible impurities, knowing, at the same time, that it might be so easily remedied? A surface-spring should always be covered, and made to issue by a pipe, half a day's labor to create a fall, and a clay drain-tube, will generally convert a filthy puddle into a crystal fount. It is singular to see this blindness to the impurity of water in people otherwise cleanly enough. This is a subject worth the attention of country physicians and clergymen. The evil effects of drinking impure water are not confined to towns. May not the putrid sore throat and malignant fevers that often sweep away whole households in the country, especially in autumn, be partly owing to the cause now pointed at?

Deep wells should invariably be covered, and carefully protected from the infiltration of superficial ooze. The situation of pump-wells is often singularly ill chosen in this respect. The gravitation, reservoir, and direct pumping system, are the three methods of supplying water to cities. Where a sufficient supply can be collected and stored, at an elevation giving the necessary head, no other force than gravity is needed. In the second system the water is pumped up into a reservoir; if there be no elevated ground for the reservoir, a stand-pipe is employed, to secure sufficient head and constancy of pressure. Stand-pipes are, some of them, 170 ft. high, and are single or double. In level cities the stand-pipe partly takes the place of the reservoir. In the Holly, or direct pumping system, the water is pumped directly into the distributing mains, thus avoiding the first cost of reservoir or stand-pipe. In case of fire, extra pressure is put on, and a stream of water can be thrown without the aid of an engine. The cost of construction of water-works varies from $10 to $40 per capita, according to the system used, and the population. See Sanitary Science, Artesian Wells.

WATER-TABLE, a set-off in a wall sloped on top to throw off the rain.

WATER TOWER, a long pipe capable of being raised to a vertical position; used by fire companies to throw a stream of water into the upper stories of a building. A flexible pipe connects with the lower end of the W. T., terminating in several inlets, into each of which water is pumped by the engines. The W. T. is mounted on trunnions; a short piece of flexible pipe, moving between two side flanges, is fixed at the end of the pipe, between it and the nozzle; a stud projects from each side of the nozzle, entering a groove in the flange; and a wire rope connects this nozzle with a drum on the truck below. The water is sent downward from the nozzle by winding up this rope; and the reverse movement is accomplished by unwinding it. The W. T. may be moved on its own axis; and the stream may be directed in any direction. The fire-boats used in New York harbor for the protection of the shipping, are provided with water-towers.

WATERTOWN, a town in Middlesex co., Mass.; on the Charles river and the Fitchburg railroad; 8 m. w. of Boston. It was incorporated in 1630, and contains the villages of Watertown, East Watertown, Mount Auburn, Union Market, Arsenal, and Bemis. The town is connected with Boston by electric railroad; is the seat of a U. S. arsenal; and has a high school, public library, electric lights, national, savings, and co-operative banks, and manufactories of woolen, rubber, and elastic goods, stoves, starch, hosiery, cardigan jackets, needles, and indurated ware. Pop. '90, 7073.

WATERTOWN, city and co. seat of Jefferson co., N. Y.; on the Black river and the main and branch lines of the Rome, Watertown, and Ogdensburg railroad; 10 m. e. of lake Ontario, 69 m. n. of Syracuse. The river here is nearly 200 ft. wide, is spanned by several bridges, and has falls and rapids which provide good power for manufacturing. There are gas and electric lights, electric street railroads, several small public parks, national and savings banks, high and graded schools, Y. M. C. A., and high school libraries, convent of the Immaculate Conception, Irving school, kindergarten, and daily, weekly, and monthly periodicals. The principal manufactures are foundry and machine shop products, paper, woolen goods, leather, agricultural implements, wagons, carriages, air and vacuum brakes, furniture, printing presses, electrical apparatus, and sleighs. Pop. '90, 14,725.

WATERTOWN, a city in Dodge and Jefferson cos., Wis.; on the Rock river, and the Chicago, Milwaukee, and St. Paul and the Chicago and Northwestern railroads; 45 m. w. by n.w. of Milwaukee. It is the seat of the Northwestern university (Lutheran), and the Sacred Heart university (R. C.), and has a high school, university libraries, gas and electric lights, national and state banks, about a dozen churches, public park and daily and weekly newspapers. The river is here crossed by several bridges, and by two dams, provides power for manufacturing. There are several mills, breweries, large malt-house, foundry, shoe factory, and brass works. Pop. '90, 8755.

WATERVILLE, a city in Kennebec co., Me.; on the Kennebec river and the Maine Central railroad; 18 m. n. of Augusta. It is the seat of Colby university (q. v.), and of

the Coburn classical institute, and has a high school, college, and other libraries, electric lights, electric street railroads, waterworks, national and savings banks, building and loan associations, and daily, weekly, and monthly periodicals. Power for manufacturing is supplied by Ticonic falls. The leading industrial plants are the car and locomotive shops of the Maine Central railroad, and cotton, paper, and pulp mills. Pop. '90, 7107.

WATERVLIET, a city in Albany co., N. Y.; on the Hudson river, the Erie canal, and the Delaware and Hudson railroad; opposite Troy. It was chartered as a city in 1896, having previously been known as the village of West Troy. The city is the seat of the famous Watervliet arsenal, established by the U. S. government in 1807. The plant includes foundries and shops for making field, coast defense, and siege guns, shot and shell, gun carriages, and small ammunition. The city also contains a large and noted bell foundry, and extensive car works. There are electric light and street railroad plants, national bank, nearly a dozen churches, and a weekly newspaper. Pop. '90, 12,967.

WATER VIOLET. See HOTTONIA.

WATER YAM. See LATTICE LEAF.

WATERY GRIPES is the popular name for a form of serous diarrhea occurring in infants, in which there are copious discharges of thin watery motions, often limpid, or almost colorless, and occasionally intermixed with flakes or shreds. This form of diarrhea may be induced in weakly children by sudden impressions of cold on the surface, so as to check perspiration; or it may be brought on by cold drinks taken when the body is heated. The exhaustion brought about by the copious excretions from the bowels is sometimes so great that the case might be mistaken for one of cholera. See CHOLERA INFANTUM.

WATKINS GLEN, in Schuyler co., N. Y., a deep and rugged ravine ascending between two long ranges of low hills on the w. side of the Seneca Lake valley. It derives its name from the neighboring village of Watkins. Its course is nearly e. and w., and it rises 800 ft. in about 3 miles. The remarkable forms assumed by the river rocks, and the cascades on the falling stream make it one of the most charming of American glens, and it is visited annually by over 50,000 persons. Among the principal objects of interest are Glen Alpha, the cathedral, the well, and Rainbow Fall.

WATKINSON, DAVID, 1778–1857; b. Suffolk, England; educated by Mrs. Barbauld. In 1795 his parents came to this country and settled in Middletown, Conn. He engaged in business in New York city and in Hartford, and in 1841 retired. Most of his life was spent in Hartford. By his will liberal legacies were given to several public institutions, the more notable being $100,000 for the formation of the Watkinson library and $40,000 to the Hartford hospital and for the foundation of a juvenile asylum.

WATLING STREET, one of the great Roman highways of Britain, commencing at Dover, passing through Canterbury and Rochester to London, and thence through Uriconium and Chester to Caer-Seiont, the ancient *Segontium,* in Caernarvonshire. From Uriconium a branch proceeded n. by Manchester, Lancaster, and Kendal, into Scotland. Traces of the ancient road are still to be found in many parts of its course, and in some it is still an important highway. A street in London retains its name. The origin of this name is very uncertain; the most probable supposition is that the original name was *Stratum Vitellianum.*

WATLING ISLAND, one of the Bahamas (q.v.).

WAT'ONWAN, a co. of s. Minnesota; 430 sq. m.; pop. '90, 7746. Co. seat, St. James.

WATSON, ALFRED AUGUSTIN, D.D., D.C.L., b. New York, 1818; graduated at the univ. of New York, 1837; studied law, but, having determined upon the life of a minister, he was ordained priest in the Prot. Epis. church, 1845. He had several charges in N. Carolina, and was chaplain of the 2d regiment troops of that state. He was consecrated the first bp. of East Carolina, 1884.

WATSON, HENRY COOD, 1816–75; b. London, Eng.; as a child, showed musical talent, and in 1829 appeared at the Covent Garden theater in Weber's *Oberon.* He became a musical critic and composer, in 1840 came to New York, and was connected with several of the journals of the day as art and musical critic, as well as a writer on other topics. In 1845, with Poe and Charles F. Briggs, he founded the *Broadway Journal,* which proved a failure financially, though conducted with ability. He was one of the founders of the Philharmonic society of New York, and had a chief share in organizing the notable Castle Garden Mendelssohn concert. In 1855 he founded *The Musical Guest,* and published many of his own compositions in its columns. Later he was editor-in-chief of *Frank Leslie's Illustrated Newspaper;* in 1862 started the *Art Journal,* and for the last 12 years of his life was the musical critic of the New York *Tribune.*

WATSON, JAMES CRAIG, 1838–80; b. Canada West, of American parents; graduated at the university of Michigan, 1857; a teacher there for some time of mathematics, and an assistant at the observatory; appointed prof. of astronomy, 1859, and of physics and mathematics, 1860; became director of the observatory in 1863; took charge of the observatory of the Wisconsin state university, 1877. He discovered many asteroids. He was at the head of the successful American expedition which observed the transit of Venus at Peking, China, 1874. He was awarded in 1870 the gold medal of the French academy of sciences for his various astronomical discoveries. He prepared many

astronomical charts; was the author of a *Popular Treatise on Comets*, and a work on *Theoretical Astronomy*.

WATSON, JOHN (IAN MACLAREN), clergyman and author, b. at Manningtree, Essex, England, of Scotch parents, in 1850; educated at Edinburgh university, New College, Edinburgh, and Tübingen. On completing his studies he decided to become a minister of the Free church, largely, it is said, to gratify the wishes of his father, and in 1874 he received his license. After serving as assistant for a short time to Dr. J. H. Wilson of the Barclay church, Edinburgh, he was ordained in 1875 as minister of the Free church in Logiealmond, where his close contact with the life of a little Scotch community furnished him with material and suggested types for many of his stories. Logiealmond has been identified with the "Drumtochty" of these stories, although Dr. Watson has said that no real person has been described in his writings, and that where types have suggested themselves to his mind they have been so idealized as to be unrecognizable in the original. After leaving Logiealmond he ministered for three years at Free St. Matthew's, Glasgow, and was then called to Sefton Park church, Liverpool (1880). Before this he had conceived the idea of writing a book dealing with local Scotch life, but distrust of his own powers prevented him from carrying it out till many years later. When his first volume of stories appeared, under the title of *Beside the Bonnie Brier Bush* (1894), its success was instant and complete. It was published both in England and America. It was followed by *The Days of Auld Lang Syne*, and *The Upper Room* (both in 1895), *Kate Carnegie*, *The Mind of the Master* and *The Cure of Souls* (Yale Lectures on Practical Theology, 1896). In the winter of 1896–97 Dr. Watson visited the United States, where he was received with unusual evidences of popular esteem. In 1897 a drama based on the characters and incidents of his stories and entitled *Beside the Bonnie Brier Bush*, was prepared for the stage by James MacArthur in collaboration with Tom Hall.

WATSON, RICHARD, D.D., 1737–1816; b. England; graduated Cambridge, 1759; obtained a fellowship, 1760; ordained in the church of England; prof. of chemistry, 1764; tutor at Trinity college, 1767; regius prof. of divinity, Cambridge, and rector, Somersham, 1771; archdeacon of Ely, 1780; bishop of Llandaff, 1782. His chief works are *An Apology for Christianity, in a Series of Letters, addressed to Edward Gibbon, Esq.; Chemical Essays; A Sermon on the Wisdom and Goodness of God, in having made Rich and Poor; An Apology for the Bible, in a Series of Letters, addressed to Thomas Paine; Miscellaneous Tracts.*

WATSON, RICHARD, 1781–1833; b. England; was apprenticed at the age of 14 to a carpenter; joined the Methodists, 1796; ordained, 1800; became a member of the conference. After a few years he joined the Methodist new connection; was stationed at Manchester and Liverpool, and edited the Liverpool *Courier;* returned to the regular Wesleyan connection; was stationed in London; was one of the secretaries of the missionary society, and a teacher of theology to candidates for the ministry; was elected president of the conference in 1826. He published *A Defense of the Methodist Missions in the West Indies; Remarks on the Eternal Sonship of Christ;* and *Use of Reason in Matters of Revelation; Theological Institutes; Conversations on Scripture for the Young; Biblical and Theological Dictionary.*

WATSON, WILLIAM, poet, b. in Wharfedale, Yorkshire, Eng.; began to write verse at an early age but did not attract favorable notice until his publication of the *Epigrams of Art* (1884). In the following year he published a series of sonnets in the *National Review*, entitled *Ver tenebrosum*, in which he attacked the policy of the English in Egyptian affairs. In 1892 his poem called *Wordsworth's Grave and Other Poems* gave him considerable fame, and in the same year he wrote a memorial poem to Tennyson under the title of *Lachrymae Musarum*. This poem was greatly admired by Mr. Gladstone, and the author received a pension from the government. Among his later works are *Lyric Love* (1892); *The Eloping Angels* (1893); *Excursions in Criticism* (1893); *Odes and Other Poems* (1894); *The Father of the Forest* (1895); and *The Purple East* (1896); the last named having for its subject the Armenian difficulty.

WATT, JAMES, mechanician, engineer, and man of science, famous as the improver, and almost the inventor of the steam-engine, was born at Greenock, in Scotland, Jan. 19, 1736. His father was a blockmaker and general merchant at Greenock, was long a member of the council of that burgh, and for a time a magistrate. Two members of James Watt's family—his grandfather and his uncle—had had some local reputation for scientific or engineering ability. The former was a teacher of mathematics, surveying, and navigation at Crawfordsdyke, near Greenock; the latter practiced as a land-surveyor and engineer with great success at Ayr. The grandfather, Thomas Watt, had been brought early in life to Lanarkshire from the neighborhood of Aberdeen, where his family had previously lived. The father of Thomas Watt, the great-grandfather of James, is said to have farmed a little property of his own in Aberdeenshire, and to have been killed while fighting on the side of the Covenanters against the marquis of Montrose.

James Watt was very weakly as a child, and being unable to go to school with regularity, he became, to a great extent, his own instructor. What schooling he did get, he got in the schools of his native town. He early manifested a turn for mathematics and calculations, and a great interest in machines, and accordingly—his father's business, for which he had been destined, having greatly declined—he was, at the age of 18, sent to London, to learn the trade of a mathematical instrument maker. Ill-health compelled

him to return home about a year after; but he had made good use of his opportunities in London; and on his health improving, he resolved to set up as a mathematical instrument maker in Glasgow. The incorporation of hammermen of that city put difficulties in his way; but the authorities of the university took him by the hand, appointed him mathematical instrument maker to the university, and gave him the use of premises within their precincts. He occupied these premises from 1757 to 1763. They seem to have been badly situated for his business, for which, moreover, at that time there was but little room in Glasgow; and Watt during those years was scarcely able to make a living. In 1763 he got a place of business in the town, and after that he did somewhat better; still, he had to eke out his income by making or mending fiddles (which he was able to do, though he had no ear for music), or doing any mechanical job which came in his way; and no work requiring ingenuity or the application of scientific knowledge seems to have come amiss to him. At length, in 1767, he fell upon a new and a more lucrative occupation. In that year he was employed to make the surveys and prepare the estimates for a canal projected to unite the Forth and the Clyde. This work could not be carried out at the time, because it failed to obtain the sanction of parliament; but Watt had now made a beginning as a civil engineer, and henceforth he got a good deal of employment in this capacity. He made surveys for various canals, for the improvement of the harbors of Ayr, Port-Glasgow, and Greenock, and for the deepening of the Forth, the Clyde, and other rivers. One of the tasks committed to him was to decide whether a projected canal between the firth of Clyde and the Western ocean should be made by way of Crinan or of Tarbert; and the last—also the greatest—undertaking of this kind on which he was employed was a survey for a canal between fort William and Inverness; a work which has since been executed on a greater scale by Telford. In his surveys, he made use of a new micrometer, and of a machine, also of his own invention, for drawing in perspective—the latter of which appears to have been for several years about this time one of his sources of income. The reports which he drew up in the capacity of engineer are said to have been remarkable for perspicuity and accuracy.

Living in the college at Glasgow, in constant intercourse with the professors of the university, with access to books, and with much unemployed time on his hands—having, too, a great love of knowledge, and a lively interest in mechanical novelties—Watt had been a diligent student of science, and experimenter in the application of science to the arts. As early as 1759 his attention had been directed to the capabilities of steam as a motive-force by Mr. Robison (q.v.), afterward professor of natural philosophy in the university of Edinburgh, who was then a student in Glasgow. It had occurred to Mr. Robison that steam-pressure might be used to propel wheeled-carriages; but it does not appear that either Watt or he attempted to carry out this idea. In 1761 or 1762, however, Watt made a series of experiments on the force of steam, using a Papin's digester. These do not seem to have led to any results; and it was not till the winter of 1763–64 that he began the investigations which ended in his improvement of the steam-engine. During that winter a working model of the Newcomen engine, kept for the use of the natural philosophy class in the college, was sent to him to be put in repair. Watt quickly found out what was wrong with the model, and easily put it into order. But in doing this he became greatly impressed with the defects of the machine, and with the importance of getting rid of them. The Newcomen engine (see STEAM-ENGINE) was still but little used, and only for pumping water out of mines. It was a cumbersome machine, and it required so much fuel that the expense of working it had restricted, and must always have restricted its use. It was not a steam-engine at all. It was worked by means of the atmospheric pressure; steam being only used in producing by its condensation, a vacuum in a cylinder, into which—the vacuum made—a piston was depressed by the pressure of the air. The steam issuing from a boiler was admitted into the cylinder until it filled it, when the supply was cut off by a self-acting cock; and then the steam was condensed in the cylinder by means of a jet of water. The water so greatly cooled the cylinder that the greater part of the steam at each stroke of the piston was wasted in heating its walls; and on the other hand, much of the injected water was heated to the boiling-point, and gave off steam which resisted the descent of the piston. Watt found that about four-fifths of the steam, and consequently of the fuel, was wasted; and he saw that to make the machine work economically, two apparently incompatible conditions must be obtained—first, that the walls of the cylinder must constantly be of the same temperature as the steam which came in contact with them; and second, that the injected water must never be heated up to 100°, the boiling-point *in vacuo*. He now experimented upon the conducting power of various substances, and made trial of a cylinder made of wood steeped in oil; but with this cylinder, though it cooled les rapidly than a metallic one, there was still far too much waste of steam. Constantly, from the end of 1763, occupied with the subject of steam, he at length, early in 1765, hit upon the expedient which solved all his difficulties—the separate condenser, an air-exhausted vessel, into which the steam should be admitted from the cylinder and there condensed. The separate condenser at once prevented the loss of steam in the cylinder which had arisen in the process of condensation; and there was no difficulty in keeping it cool, so as to prevent the undue heating of the injection-water. He had now got a perfectly economical engine on Newcomen's principle, but he did not rest content with

this—he resolved to make steam his motive-power. Closing the cylinder at both top and bottom, and connecting the piston with the beam, to which it was to communicate motion, by a piston-rod passing through a stuffing-box, he admitted the steam by suitable valves alternately above and below the piston, to push it downward and upward in turn; and this done, his invention was substantially complete. He had at last made a real steam-engine, capable of being worked with a comparatively small expenditure of fuel, and of yielding any desired amount of power. Comparing his invention with the atmospheric engine of Newcomen, it must be admitted that it is not without justice that the popular voice has awarded him the name of inventor of the steam-engine.

Watt, soon after perfecting his model, formed a partnership with Dr. Roebuck, then of the Carron iron-works, for the construction of engines on a scale adapted to practical uses; and a model was erected at Kinneil, near Borrowstounness, where Dr. Roebuck then lived. But Roebuck got into difficulties; and nothing further was done until, in 1773, Watt entered into a partnership with Matthew Boulton of Soho, near Birmingham, when, Roebuck's interest having been repurchased, the manufacture of the new engine was commenced at the Soho iron-works. A patent for his invention had been taken by Watt in 1769. He got from parliament a prolongation of his patent for 25 years in 1775.

The advantages of the new engine were in no long time found out by the proprietors of mines; and it soon superseded Newcomen's machine as a pumping-engine. Watt afterward made numerous improvements in its construction (for the most important of which see STEAM-ENGINE); and in conjuction with his partner Boulton, he immensely improved the quality of the workmanship employed in building engines and other machines. In the years 1781, 1782, 1784, 1785, he obtained patents for a series of inventions—among them the sun-and-planet motion, the expansive principle, the double engine, the parallel motion, and the smokeless furnace, of most of which the chief purpose was to make steam-pressure available for turning machinery in mills. The accomplishment of this—extending the application of the new power to the arts—was of scarcely inferior importance to the invention of the steam-engine itself. The first contrivance invented by Watt for this purpose was lost to him through the treachery of a mechanic, who had been employed in making the model, who sold it to a manufacturer named Prickards, who got a patent for it for himself. The application to the steam-engine of the governor (see STEAM-ENGINE) was Watt's crowning improvement. He made numerous inventions unconnected with the steam-engine, several of which he patented, but they are all of minor importance.

He retired from business in the year 1800, giving up to his two sons his interest in the extensive and prosperous business which Boulton had created at Soho. He died at Heathfield in Staffordshire, on Aug. 25, 1819, in his 84th year. Watt was twice married: first in 1763, to his cousin, Miss Miller; and a second time shortly after his removal to Birmingham, to a Miss M'Gregor of Glasgow. He had a most extensive and accurate knowledge of the physical sciences—to several of which he made important contributions—and an almost unsurpassed fund of general information. (His claims to be considered the discoverer of the composition of water are considered in the article WATER.) He was elected a fellow of the Royal Society of Edinburgh in 1784; a fellow of the Royal Society of London in 1785; a corresponding member of the Batavian Society in 1787; and in 1808, a corresponding member, and afterward a foreign member, of the institute of France. The university of Glasgow conferred on him the degree of LL.D. in 1806. His statue, the funds for which had been raised by a public and almost a national subscription, was erected in Birmingham in 1824; and his statue is now to be seen in the streets of many of our larger towns. The honor paid to his memory and to himself in his later years appear to have been deserved by his personal qualities, no less than by the immeasurable benefits which his inventive talents have conferred upon the human race.

WATTEAU, ANTOINE, was b. at Valenciennes, in the year 1684. In 1702 he betook himself to Paris, where for some time he worked as assistant to a scene painter. When this employment failed him, by the retirement of his master from Paris, he employed himself in copying pictures. The talent which he showed in this humble walk of the art drew the attention of Gillot, a popular painter of the day, who engaged him to assist in his studio. In no long time it was found that the pupil excelled his master, who speedily relinquished the field in his favor, and became an engraver. The success of Watteau was now assured; he was made a member of the French academy, and became by special favor *peintre de fêtes galantes du roi*. In 1718 he visited England, it is believed chiefly on account of his health, and to consult a certain Dr. Meade, then famous, for whom, during his stay, he painted one or two pictures. He remained about a year, without, as it should seem, much benefit. After his return home, his health gradually declined; and in 1721 he died at Nogent, near Paris.

In virtue of their charming color and graceful design, the pictures of Watteau continue to please, though his reputation as an artist is now but a faint echo of that which, in his lifetime, he enjoyed. He employed himself chiefly in painting small landscapes, with something of the nature of the *fête galante* going on in them—idylls in court-dress, which, as preserving for us the fopperies of the time, are not without a certain value distinct from their properly artistic one.

WATTERSON, HENRY, b. D. C., 1840; editor of the *Democratic Review* in 1858; removed to Tennessee in 1861, and was in the confederate army during the civil war except for one year, when he edited the Chattanooga *Rebel*. For a year after the war he was editor of the Nashville *Banner*. On the death of G. D. Prentice he became editor of the Louisville *Journal*, afterwards consolidated with other papers, and called the *Courier-Journal*. He was elected to congress in 1876. In 1892 Mr. Watterson was very influential in committing the Democratic party to the policy of a radical reform of the tariff. He has published *Oddities of Southern Life and Character* (1883).

WATTERSON, JOHN AMBROSE, D.D., b. Blairsville, Penn., 1844; was educated at St. Vincent's coll., Penn., and at St. Mary's coll. and sem., Md.; was ordained a Rom. Cath. priest, 1868; held the chair of classics at St. Mary's coll., and then of theology, and was elected pres. of the coll. and sem., 1880. He was consecrated bp. of Columbus, O., 1880.

WATTLE. See ACACIA.

WATTLE-BIRD, *Anthochæra carunculata*, an Australian bird, of the family of honey-eaters (*meliphagidæ*). It is about the size of a magpie, grayish brown above, each feather striped, and bordered with white; the tail brown, long, wide, and graduated. It derives its name from a pendulous reddish wattle on each side of the throat.

WATTS, GEORGE FREDERICK, b. London, Eng., 1817. His first large oil-paintings, "Echo," and "Alfred inciting the Saxons," received a prize of £500 at the Westminster Hall competition of 1843, and were placed in the then new houses of parliament, for which he also painted "St. George overcoming the Dragon." In 1867 he became a royal academician. He has executed several large fresco designs of merit, the best being that in Lincoln's Inn hall, representing the law-givers of different ages and races, and some remarkable portraits. He retired 1896.

WATTS, HENRY, 1815–84; b. and d. London; graduated at Univ. coll. in 1841. His writings on chemistry are valuable and very extensive. In 1850 he was appointed editor of the *Journal of the Chemical Soc.*, and in 1866 was chosen a Fellow of the Royal Society.

WATTS, ISAAC, was b. on July 17, 1674, at Southampton, where his father had a boarding-school. He was educated at the grammar-school of his native place, and afterward sent, at the age of 16, to an academy in London, kept by Mr. Thomas Rowe, an Independent minister. Here his devotion to his studies was so excessive as to permanently injure his constitution. In 1696 he became tutor in the family of sir John Hartopp, at Stoke-Newington, with whom he remained six years. During the latter part of this time he officiated as assistant to Dr. Chauncey, minister of the Independent church in Mark lane, to whose post he succeeded in 1702. His health was throughout infirm; and in 1712 he was prostrated by an illness so violent that he never thoroughly recovered from its effects, though he lived for many years afterward. A visit which he paid to sir Thomas Abney, at Theobalds, for change of air, resulted in his domestication in the establishment till his death, 36 years afterward, on Nov. 25, 1748. As his health permitted, he continued to discharge his clerical duties, and to occupy himself with literary pursuits. His theological works were numerous, but are now quite forgotten. His treatise on *Logic*, though long since superseded, had in its day a considerable reputation, and was adopted as a text-book by the university of Oxford. "He was," says Montgomery, "almost the inventor of hymns in our language." His poetical works are: *Horæ Lyricæ; Hymns and Spiritual Songs; Psalms of David in the Language of the New Testament; Divine and Moral Songs for Children.* His psalms and hymns were long used exclusively in the churches, and many of them are found in all modern church collections. A complete collection of his works was published by Drs. Jennings and Doddridge (6 vols. 4to. 1754).

WATTS, JOHN, 1749–1836, b. N. Y.; recorder of New York. He was a member of congress, 1793–96; and judge of Westchester co., 1802–8. He founded an orphan asylum in New York. His father JOHN (1715–89) was an extensive land-holder, who served for many years in the legislature, and in the council. He married a sister of James De Lancey, the governor of New York, was a partisan of the royalists, and left the colony for England in 1775. His estates were confiscated.

WATTS, THOMAS, a distinguished philologist and librarian, was b. in London in the year 1811. At school he studied Latin and French, and in due time Greek as well; but he principally distinguished himself by his attainments in English. He read every book that came in his way, and he wrote, apparently with the utmost ease, tales, essays, and poetry, very much above the average, not alone of school-boy composition, but of the magazine-writing of the day. To a knowledge of the classics and French, Watts soon added an acquaintance with the other languages of the Latin family—as Italian, Spanish, and Portuguese; likewise with the German, Dutch, Swedish, Danish, and Icelandic. The facility with which he acquired these several languages, encouraged him to undertake, from time to time, the study of some of the oriental tongues, viz., Hebrew, Arabic, Persian, Turkish, and even Chinese. In each of these he made considerable progress, but cannot be said to have mastered any of them as he did those languages before named, and as he subsequently mastered the Russian, Polish, and Hungarian. There are few Englishmen who know anything of the three languages last named, which Watts could read and translate with the utmost ease—being as familiar

in fact, with their great writers as he was with those of Germany or France. It remains only to mention that Watts was also well acquainted with the Welsh language and literature, besides having some knowledge of the Gaelic and Irish as well. Upward of 20 languages have thus been named with which he was well acquainted. No other Englishman has approached him as a linguist, considering the *variety* as well as the *number* of languages which he acquired; while of foreigners, it is not too much to say that Mezzofanti alone appears to have surpassed him.

In 1832 Watts first became a "reader" in the reading-room of the British museum, where, in studying some of the languages mentioned, he became acquainted with the deficiencies in the literature of other countries under which the national library then labored. In 1837 the Rev. Mr. Baber, then keeper of the printed books, purchased, at his recommendation, a small collection of Russian books, which Watts offered to catalogue as a volunteer. This brought him the acquaintance of Mr. Panizzi, who, becoming aware of his attainments, recommended him for employment in the library. Accordingly, he was engaged as an assistant in the department of printed books, Jan., 1838. At that time, the books were being transferred from the old rooms in Montague house to the new library. It was Watts's duty to assist in the rearrangement of the books, and when this was finished, he was intrusted with the responsible duty of arranging and placing on their shelves, according to subjects, all the new works purchased or otherwise acquired for the library. For this his vast acquirements as a linguist eminently qualified him. In other respects also his knowledge of languages was brought to bear in the service of the museum. He drew up lists of desiderata in all the languages of Europe. It was at his suggestion also that the first large orders were given for American books. "The object" (says Watts in a letter to the principal librarian in 1861, printed by order of the house of commons in 1866) "which has been kept in view during the last three-and-twenty years has been to bring together from all quarters, the useful, the elegant, and the curious literature of every language; to unite with the best English library in England or the world the best Russian library out of Russia, the best German out of Germany, the best Spanish out of Spain, and so for every language from Italian to Icelandic, from Polish to Portuguese. In five of the languages in which it now claims this species of supremacy, in Russian, Polish, Hungarian, Danish, and Swedish, I believe I may say that, with the exception of perhaps fifty volumes, every book that has been purchased by the museum within the last three-and-twenty years has been purchased at my suggestion. I have the pleasure of reflecting that every future student of the less known literatures of Europe will find riches where I found poverty." The number of books classified and arranged by Watts, while only an assistant in the library, is reckoned at about 400,000 volumes, and of these as many as 100,000 were arranged upon a plan of his own invention, now known as "the elastic system." "One of the advantages," he says, in the letter before mentioned, "obtained by this system is, that when the new library, which surrounds the new reading-room, was ready for the reception of books, these 100,000 volumes were removed to their new locality without the necessity of altering a single press-mark: had the operation of altering the press-marks been still required, as under the former system, the amount of labor necessary to effect it would have been enormous, and the expense not less than some thousands of pounds." Here it may be mentioned that it was Watts who first suggested the erection of a library and large reading-room in the vacant quadrangle, where now rises the splendid dome erected under the auspices of Panizzi. The suggestion was originally made in a series of articles contributed anonymously to the *Mechanics' Magazine* for 1836 and 1837, since that time acknowledged by Watts as his own. In one of these, speaking of the quadrangle, he says: "The space thus unfortunately wasted would have provided accommodation for the whole library. A reading-room of ample dimensions might have stood in the center, and been surrounded on all four sides by galleries for the books, communicating with each other, and lighted from the top." In 1856 Watts was promoted to be assistant-keeper of the printed books; and on the opening of the splendid new reading-room in 1857, he was most fitly appointed its superintendent. In Aug., 1866, Watts was appointed keeper of the department of printed books. He died Sept. 9, 1869. Watts was a member of the philological society of London; he was also an honorary member of the Hungarian academy, to which he was elected at the same time as the late lord Macaulay. Among the literary productions of Watts may be mentioned: "Notes of a Reader," contributed to a weekly periodical entitled *The Spirit of Literature*, 1830; numerous poetical pieces contributed to Linnington's *Rhetorical Speaker and Poetical Class-Book*, 1833; *A Letter to Antonio Panizzi, Esq., on the reputed Earliest Printed Newspaper, "The English Mercurie*, 1588," 1839; *A Sketch of the History of the Welsh Language and Literature* (reprinted from Knight's *English Cyclopædia*), 1839; more than a hundred biographies of eminent men, Russian, Hungarian, Bohemian, etc., contributed to the same *Cyclopædia;* numerous articles in the *Biographical Dictionary* of the society for the diffusion of useful knowledge; papers in the *Transactions of the Philological Society*, among which are an "Essay on the Hungarian language," and a biographical notice of cardinal Mezzofanti; also contributions to the *Quarterly Review*, the *Athenæum*, and other literary periodicals.

WAT TYLER. See Tyler Insurrection.

WAUKEGAN, city and co. seat of Lake co., Ill.; on lake Michigan, and the Chicago and Northwestern and the Elgin, Joliet, and Eastern railroads; 35 miles n. of Chicago. It contains a high school, St. Joseph's school, school of the Immaculate Conception, St. Alberta's convent, public library, hospital, national and state banks, electric and acetylene gas light plants, electric street railroads, and waterworks supplied from the lake. The manufactories include extensive wire and iron works, sugar refinery, starch and lubricating works, and foundries and machine shops. The city also has a large interest in the lake fisheries. Pop. '90, 4915.

WAUKE'SHA, a co. in s.e. Wis.; 576 sq. m.; pop. '90, 33,270. Co. seat, Waukesha.

WAUKESHA, city and co. seat of Waukesha co., Wis.; on the Fox river, and the Chicago, Milwaukee, and St. Paul, the Chicago and Northwestern, and the Wisconsin Central railroads; 20 miles w. of Milwaukee. It is the seat of the state industrial school for boys, and of Carroll college (Pres.), and has a high school, Keeley institute, electric lights, about a dozen churches, national banks, the shops of the Wisconsin Central railroad, large malleable iron works, numerous mineral springs and bottling works, and quarries of good building-stone. Pop. '90, 6321.

WAUPAC'A, a co. in e. Wisconsin; 756 sq. m.; pop. '90, 26,794. Co. seat, Waupaca.

WAUSAU, city and co. seat of Marathon co., Wis.; on the Wisconsin river, and the Chicago, Milwaukee, and St. Paul, and the Chicago and Northwestern railroads; 40 miles n. of Stevens Point. It has electric lights, waterworks, public parks, national banks, about 20 churches, co. court-house, co. insane asylum, and daily and weekly newspapers. The principal industries are those connected with the lumber trade, and milling, mining, and granite quarrying. Pop. '90, 9253.

WAUSHA'RA, a co. in central Wisconsin, bounded on the s.e. by Fox river; 645 sq. m.; pop. '90, 13,507. Co. seat, Wautoma.

WAVE, the name given to a *state of disturbance* propagated from one set of particles or a medium to the adjoining set, and so on; sometimes with, sometimes without, a small permanent displacement of these particles. But the essential characteristic is, that energy (see FORCE), not matter (q.v.), is on the whole transferred. The theory of wave-motion is of the utmost importance in physical science; since, besides the tide-wave, waves in the sea, in ponds, or in canals, undulations in a stretched cord (such as a piano-forte wire), or in a solid (as sound-waves or earthquake-waves), we know that sounds in air are propagated as waves (see SOUND), and that even light (see UNDULATORY THEORY) is a form of wave-motion.

In the present article we will merely *state* some of the more important conclusions which mathematical analysis has established in the more difficult of these inquiries, comparing them with the observations of Scott Russell and others; while we give at full length the very simple investigations of the motion of a wave along a stretched cord, and of the propagation of a particular kind of sound-wave.

To find the rate at which an undulation runs along a stretched cord, as for instance, when a harp-string is sharply struck or plucked near one end, a very simple investigation suffices. Suppose a uniform cord to be stretched with a given tension in a smooth tube of any form whatever, we may easily show that there is a certain velocity with which the cord must be drawn through the tube in order *to cease to press on it at any point*, that is, to move independently of the tube altogether. For the pressure on the tube is due to the tension of the cord; and is relieved by the so-called centrifugal force (see CENTRAL FORCES) when the cord is in motion.

If T be the tension of the cord, r the radius of curvature of the tube at any point, the pressure on the tube per unit of length is

$$\frac{T}{r}.$$

If m be the mass of unit length of the cord, v its velocity, the centrifugal force is

$$\frac{mv^2}{r}.$$

These are equal in magnitude, and so destroy each other, if

$$T = mv^2.$$

Hence, if the cord be pulled through the tube with the velocity thus determined, there will be no pressure on the tube, and *it may therefore be dispensed with.* If we suppose the tube to have a form such as that in the figure, where the extreme portions are in one straight line, the cord will appear to be drawn with velocity v, along this, the curved part being occupied by each portion of the cord in succession; presenting something like the appearance of a row of sheep in Indian file, jumping over a hedge.

FIG. 1.

To a spectator moving in the direction of the arrow with velocity v, the straight parts of the cord will appear to be at rest, while an undulation of *any* definite form and size whatever runs along it with velocity v, in the opposite direction. This is a very singular case, and illustrates the possibility of the propagation of a *solitary* wave.

Thus we have proved that the velocity with which an undulation runs along such a cord is

$$\sqrt{\frac{T}{m}}.$$

If l be the length of the cord in feet, w its whole weight, W the appended weight by which it is stretched, $g = 32.2$ ft., the measure of the earth's gravity, this becomes

$$\sqrt{\frac{W}{w} lg}.$$

This formula is found to agree almost exactly with the results of experiment. We can easily see why it should be to some small extent incorrect, because we have supposed the cord to be inextensible, and perfectly flexible, which it cannot be; and we have neglected the effects of extraneous forces, such as gravity, the resistance of the air, etc.

Let us next consider the motion of air in a cylindrical tube, in the particular case in which the leg of a vibrating tuning-fork is applied at one end. This is a simple case of the propagation of sound-waves. We shall treat it by a synthetical process, somewhat like that given by Newton.

As we have already seen (see PENDULUM), a simple vibration such as that of a pendulum or tuning fork is the resolved part, in a definite line, of the uniform motion of a point in the circumference of a circle. What we have now to show is, that such a motion of all the particles of air in the pipe, the *phase* of the vibration (or the position of the particle in its path at any instant) depending on its distance from the end of the tube, is consistent with mechanical principles. When this is done, it will be easy for us to trace, in this particular example, the process by which the wave is propagated from one layer of the fluid to the next. We must now consider (a little more closely than in PENDULUM or SOUND) the nature of the simple vibration of each particle of the air.

Suppose P to move, with uniform velocity V, in the circle APB, and let PQ be drawn perpendicular to the fixed diameter, OA, then the acceleration of P's motion is $\frac{V^2}{OA}$ in the direction PO. Hence in the motion of Q, which is a simple vibration, we have, by the rule for resolving velocities and accelerations (see VELOCITY),

$$\text{Velocity of Q} = \frac{PQ}{OA} V \text{ in the direction QO};$$

$$\text{Acceleration of Q} = \frac{OQ}{OA} \frac{V^2}{OA} \text{ in the direction QO.}$$

Next consider two particles of air near one another in the axis of the tube, or the masses of air in two contiguous cross-sections of the tube. If the phase of vibration were the same for both they would be *equally* displaced from their original positions and the air between them would be neither compressed nor dilated. Hence, that a wave may pass, the phases must be different. Let, then, Q represent the position of the one particle, or layer, in its line of vibration at any instant; Q′, the simultaneous position of the other. The first will be displaced through a space OQ from its position of rest; the second, through a space OQ′; and their distance will therefore be altered by the amount QQ′, which may be taken to represent the compression or dilatation. But it is easy to see that, as P and P′ move round, QQ′ is always proportional to PQ. Hence the compression or dilatation of the air in any cross-section of the tube is proportional to the velocity with which it is moving. Hence the difference of pressures before and behind any such section is proportional to the difference of velocities—i.e., to the acceleration of the motion while the section passes over a space equal to its own thickness. And this is consistent with mechanical principles, for the *mass* of air in the section is constant, while the difference of pressures before and behind produces the acceleration, and should therefore be proportional to it. The particles of air in cross-sections of the tube therefore vibrate, each in the same period as does the tuning-fork, but the phase is *later* for each section in proportion to its distance from the fork. Where the phase is one or more whole vibrations later than that of the fork, the motion is exactly the same as that of the fork, and *simultaneous* with it. At all other points, it is the same as that of the fork, but not simultaneous. Thus the greatest displacement of the fork is immediately shared by the layer next it, later by the next layer, and so on. Thus, a *wave* of displacement travels along the tube from one section to the next, while each particle merely oscillates backward and forward through (in general) a very small space about its position of rest.

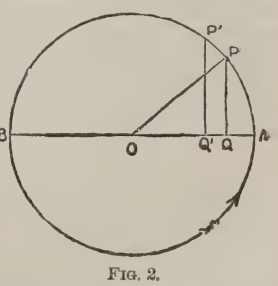


FIG. 2.

The reader who has followed the little geometrical investigation above will have no

difficulty in proving for himself that the velocity with which the wave travels is proportional to

$$\sqrt{\frac{p}{\rho}},$$

where p is the pressure, and ρ the density of the air. The easiest mode of doing this is to express, in terms of these and other quantities, the equation given us by the laws of motion,

$$\text{Mass} \times \text{Acceleration} = \text{Difference of pressures},$$

and to assume that Hooke's (q.v.) law holds, even during the *sudden* compression of air. This, we know, is not the case; so that a correction has to be applied to the above expression; depending on the heat developed by sudden compression or lost in sudden rarefaction, by each of which the elastic force of the air is *increased*. But this has been already discussed in Sound.

The above formula shows us, however, that the velocity of sound is not affected by the pressure of the air—i.e., the height of the barometer—since, in still air, p is *proportional* to ρ. The velocity does depend on the temperature, being, in fact, proportional (*ceteris paribus*) to the square root of the temperature measured from absolute zero. See Heat.

We see also from the formula that the velocity is inversely as the square root of the density of the gas—the pressure being the same. Thus a sound-wave travels about four times faster in hydrogen than in air.

Also we see that, within the limits of approximation we have used, the velocity does not depend upon the intensity, pitch, or quality of the sound (q.v.). The investigations which seem to lead to slight modifications of this conclusion are too recondite to be introduced here. We can only mention, also, the beautiful investigations of Stokes (q.v.) connected with the extinction of a sound-wave as it proceeds, partly by fluid friction, partly by radiation. And we may conclude by stating that the result of a completely general investigation of the velocity of a sound-wave gives, to a first approximation, the result we have deduced from the study of a simple particular case.

We now come to the consideration of waves in water. Of these, there are several species. One, however, we may merely mention, as its theory is the same as that just briefly discussed. This is a sound-wave, or *wave of compression*, in water. Its velocity is considerably greater than that of sound in air (see Sound). The others, which are commonly observed on the surface of water, depend on mere changes of level, and their effects; and in studying them, we may consider water as incompressible.

The first of these is what is called a *long* or *solitary* wave. Its essential characteristic is, that its length is great compared with the depth of the liquid in which it moves. To this class belong the tide-wave (see Tides), and the long wave which accompanies a canal-boat, and which we see slowly traversing the canal when the boat is stopped. Scott Russell has made many interesting observations on this wave, all of which accord well with the results of the mathematical theory of its propagation. The velocity of this wave depends solely on the depth, not on the density of the liquid in which it moves—and in a uniform canal the velocity is that which would be acquired by a stone falling freely through a space equal to half the depth of the water. Another characteristic of this wave is that, after it has passed, it leaves the water bodily transferred through a small space along the bed of the canal—forward or backward, according as it consists of an elevation or a depression of the water-surface. Scott Russell has shown that the most favorable rate at which a canal-boat can be drawn is when its velocity is such that it rides on the crest of the solitary wave. If drawn at any other speed, it leaves the solitary wave behind, or is left by it; and in either case, part of the horse's work is expended in producing fresh solitary waves. An excellent mode of observing these waves is to tilt slightly a rectangular box containing some water, and restore it to its original position. A long wave is thus formed, which is reflected repeatedly at the ends of the box, and whose rate of motion may be accurately observed by watching the image of a candle reflected at the surface of the water. If the sides of the box be made of glass, and some light particles be dispersed through the water, their motions enable us to discover all the circumstances of the propagation of this wave.

We next come to what are called *oscillatory* waves in water or other liquids. To this class belong all waves whose length from crest to crest is small compared with the depth of the liquid; from ripples on a pool to the long roll of the Atlantic. They are never observed as solitary waves, their general characteristic being their periodical recurrence. And, by watching a piece of cork floating on the surface, we see that it moves forward when at the crest of the wave, and backward through an equal amount when in the trough. Also it rises while passing from the trough to crest, and sinks from crest to trough. Mathematical investigation, confirmed by experiments with floats at sea, and with short waves in the glazed box before described, shows that each particle of the water describes a *circle* about its position of rest in the vertical plane in which the wave is advancing. Particles at greater and greater depths describe smaller and smaller circles. The diameters of these circles diminish with extreme rapidity. At a depth equal to the distance from crest to crest (i.e., the length of the wave), the displacement

of the water is already only $\frac{1}{8\,8\,5}$ of that at the surface. At the depth of two wave-lengths, it is about $\frac{1}{3\,0\,0\,0\,0\,0}$ of that at the surface. Thus we may see to how small a depth the ocean is agitated even by the most tremendous wind-waves; for, according to Scoresby, 43 ft. is about the utmost difference of level between crest and trough in ocean-waves. If the wave-length be 300 ft. (which is a large estimate), then at a depth of 300 ft. the water-particles describe circles whose radii are only the $\frac{2\,1}{8\,8\,5}$ of a foot, or about four-tenths of an in.; and at 600 ft. this is reduced to $\frac{1}{1\,2\,0\,0}$ of an in.; while the depth of the Atlantic is in many parts more than three or four miles. In this case, the velocity of propagation of the wave has been shown to be

$$\sqrt{\frac{gl}{2\pi}}$$

where g is, as before, 32.2 ft.; l is the wave-length in feet; and π is the ratio of the circumference of a circle to its diameter (see QUADRATURE OF THE CIRCLE). Thus the velocity of an oscillatory wave in deep water is proportional to the square root of its length. This fact has been of use as an analogy in helping us to account for the *dispersion* (see REFRACTION) of light, where, by experiment, we know that the waves of red light are longer than those of blue light, and also that they travel faster in refracting media. When the depth is not infinitely great compared with the length of a wave, theory and experiment agree in showing that the motion of each particle takes place in an ellipse whose major axis is horizontal. These ellipses diminish rapidly in length as we descend in the liquid, but still more rapidly in breadth; so that, as was to be expected, the particles *at* the bottom oscillate in horizontal straight lines. The expression for the velocity of propagation is now by no means so simple as in the previous cases—but is easily shown to include the values already given. So far, the first approximation. A section of the surface made by a vertical plane in the direction of the wave's motion, is shown to be bounded by the *harmonic curve*, or curve of *sines*, the form assumed by a vibrating string (see SOUND); from which it follows that the crests are similar to the troughs. The second approximation makes the troughs flatter, and the crests steeper, and also shows that the particles are, on the whole, carried *forward* by each successive wave. The amount of this progression diminishes rapidly with the depth below the surface. A third approximation shows that the velocity is, *ceteris paribus*, greater the greater is the height of the waves. When waves advance toward the shore, their circumstances change, in general gradually, from those of oscillatory waves to those of waves of translation, as the depth of the water becomes less and less considerable in comparison with the length of the wave; and it is found by experiment that they "break," as it is called, when the depth of the water is about equal to the height of the crest above the undisturbed level. All the curious phenomena of breakers are thus easily explained by the results we have already given, when they are considered with reference to the gradual alteration of the depth of the water.

Finally, we must notice a singular phenomenon often observed, viz.: that, of a series of waves breaking on the coast, every eighth, or ninth, or tenth, etc., is seen to be higher than its predecessors or successors. The explanation is simple enough, and points to the simultaneous existence of two or more sets of oscillatory waves of different lengths, due in general to quite distinct causes, which reach the shore together. This might lead us to consider the very interesting case of "*Co-existence of Small Motions*" presented by the interference (q.v.) of such waves: but we have already in various articles (see POLARIZATION, SOUND, UNDULATORY THEORY) given sufficient examples to illustrate the great principle. There remains the consideration of the propagation of waves in elastic solids, among which, at least so far as luminiferous vibrations are concerned, it appears that the ether (q.v.) must be ranked. This is a subject of a higher order of difficulty than any of those before mentioned, and, in the case of light at least, has not yet been treated in a thoroughly satisfactory manner, though such men as Cauchy, Neumann, Maccullagh, Green, and Stokes have written profound memoirs upon it. See illus., SOUND, Vol. XIII.

WAVERLY, a village in Tioga co., N. Y.; on the Chemung river and the Delaware, Lackawanna, and Western, the Erie, and the Lehigh Valley railroads; 16 miles s.e. of Elmira. It has a national bank, high school, with library, electric lights and street railroads, daily and weekly newspapers, and manufactories of toys, furniture, cigars, machinery, and car wheels. It ships large quantities of grain, and is surrounded by a farming and dairying country. Pop. '90, 4123.

WAVRE, a t. in the province of South Brabant, Belgium, situated on the Dyle, 15 m. s.e. of Brussels, has a pop. of (1890) 7575, and manufactories of cotton-yarn and paper. Wavre is better known as the scene of a desperate and protracted conflict between the French and Prussians, on June 18–19, 1815. The former, under Grouchy, Gerard, and Vandamme, advanced against the Prussians at the same time as Napoleon directed the troops under his immediate orders against Wellington at Waterloo (q.v.), and being much superior in number (32,000 to 15,200), drove the Prussians, under Thielmann, into Wavre, where they defended themselves with desperate firmness, repulsing 13 different assaults in the course of the 18th. On the following morning, Thielmann, who had heard of the victory at Waterloo, attacked Grouchy, but was repulsed with vigor, though the urgent orders of Napoleon forced the latter to retreat to Laon.

WAX. Under this term, chemists include various matters of a well-known (so-called *waxy*) appearance, derived both from the animal and the vegetable kingdoms. While in their general relations they approximate to the fats, they differ materially from the latter in their chemical composition; those of them which have been carefully examined, being found to consist partly of mixtures of alcohols and compound ethers, and partly of free fatty acids. Their general properties may be thus laid down: They are solid or semi-solid matters; are easily broken when cold, but at a moderate warmth are soft and pliable, and fuse at a temperature below 212°. They have a peculiar glistening appearance, are lighter than water, are insoluble in that fluid and in cold alcohol, but dissolve readily in ether; they are combustible, and burn with an illuminating flame, are non-volatile, and when heated in a free atmosphere, undergo decomposition. In this category are included spermaceti (which has been already considered), bees-wax, Chinese wax, and other less known kinds, as palm or vegetable wax (obtained from the bark of *ceroxylon andicola*, by the action of hot water and pressure), Carnahuba wax (an exudation from the leaves of a Brazilian palm), sugar-cane wax, etc.

Bees-wax is an animal secretion formed by the bees from sugar, and constitutes the material of which the cells of the honey-comb are composed. It is obtained by expressing the honey, and fusing the residue in boiling-water. In this state it is of a yellow color (*cera flava*). It may be bleached, so as to form white wax (*cera alba*), by being exposed in thin slices to the action of solar light, or by the action of nitric acid. (Chlorine readily destroys the color, but renders the wax unfit for candle-making, as a portion of the hydrogen of the wax is replaced by chlorine, and the candles, when burning, evolve irritating vapors of hydrochloric acid gas.) From the researches of sir B. Brodie (*Phil. Trans.*, 1848–49), it appears that wax consists of three different substances, *myricin*, *cerin*, and *cerolein*, which are separable from one another by means of alcohol. *Myricin*, which is insoluble in boiling alcohol, constitutes more than two-thirds of the bulk of ordinary wax *Cerin*, or *cerotic acid*, which dissolves in boiling alcohol, but separates on cooling, varies in quantity in different specimens. In one sample of genuine bees-wax, Brodie found that it constituted 22 per cent, and it was always present in European samples, while in Ceylon wax it was entirely absent. This curious variation in the nature of an animal secretion, under different conditions of life, resembles the variations sometimes noticed in the acids of butter, in which the butyric and caproic acids of one season are replaced in another by vaccinic acid, differing from the former acids in the amount of oxygen alone. *Cerolein*, the substance soluble in cold alcohol, is a greasy body, constituting 4 or 5 per cent of ordinary wax. Without entering into chemical details, we may observe that bees-wax yields the following derivatives: Cerotic acid or cerin, $C_{27}H_{54}O_2$; cerylic alcohol or cerolin, $C_{27}H_{55}\cdot OH$; melissylic alcohol or melissin, $C_{30}H_{60}\cdot OH$; melissic acid, $C_{30}H_{60}O_2$; palmitic acid, $C_{16}H_{32}O_2$; myricin, $C_{30}H_{61}\cdot C_{16}H_{31}O_2$; and melene, $C_{30}H_{60}$.

Chinese wax, $C_{27}H_{55}\cdot C_{27}H_{53}O_2$, is supposed to be the produce of a species of insect of the coccus family, and consists principally of cerotic acid, in combination with oxide of cerotyl.

Both yellow and white bees-wax occur in the Pharmacopœia. The characters and tests, as given in that work, are—*Of yellow wax:* "Firm, breaking with a granular fracture, yellow, having an agreeable honey-like odor; not unctuous to the touch, does not melt under 140°, yields nothing to cold rectified spirit, but is entirely soluble in oil of turpentine; boiling water in which it has been agitated, when cooled, is not rendered blue by iodine." *Of white wax:* "Hard, nearly white, translucent; not unctuous to the touch, does not melt under 150°." The iodine test is used because wax is often adulterated with starch. Wax was formerly much employed internally as an emollient medicine, in cases of suspected ulceration of the intestines. At present it is only used as an external agent, being an ingredient of many ointments and plasters.

The commercial value of bees-wax is very great; and if it were possible to ascertain the total of the quantity produced, it would cause great surprise at the amount of valuable material derived from a source apparently so insufficient. Its chief uses are for candles, modeling, medicinal cerates or ointments, besides many minor purposes. Nearly 500 tons are annually imported into Great Britain, the value of which is about £80,000; but so large is the quantity consumed in the ceremonies of the Greek and Roman churches, that Russia alone consumes more than four times that amount, and the various Catholic countries probably ten times as much. The Insect Wax of China, or Pe-la, has lately been imported in small quantities, and used in the manufacture of candles by Messrs. Price & Co.; but it is far too costly for general use (see Wax Insect). In China, this wax is very highly valued, and is so costly as to be used only by the highest classes; it is white, and breaks with a crystalline fracture and pearly luster. Of vegetable wax, there are four distinct kinds known in commerce. The first in importance is the Japan Wax, which is almost as white and compact as refined bees-wax, which it closely resembles; it was first brought to Great Britain in 1859, and since then, some very considerable importations have taken place. It is said to be obtained by boiling the seeds of a species of Rhus (*R. succedanea*). It has only been used in making candles. Brazilian Vegetable Wax is also an article of regular importation, but only in small quantities; it is obtained from the leaves of *corypha cerifera*, the carnahuba palm of the Brazilians. It forms a glossy varnish-like covering; and when the leaves

are gathered, and begin to shrink from withering, it cracks and peels off, and is collected and melted into masses. It is hard and brittle, and of a dull yellow color. The candle-makers have used it for mixing and improving other materials. In Brazil, candles are wholly made of it, or half the quantity of stearine is added. The VEGETABLE WAX of the Andes is also yielded by a palm (see WAX PALM). Although much used in Mexico, it has not yet become of commercial importance to Europe. It is chiefly used for candles in the churches. MYRTLE WAX, though rarely seen in Europe, is much used in the British colonies of North America and the United States, and at the cape of Good Hope; it is also in use in Brazil. It is procured by boiling the berries of *myrica cerifera* in North America, and probably from other species in Brazil, and at the cape of Good Hope. It resembles bees-wax very much, except that it has a greenish yellow instead of a yellow color. It is only used for candle-making. See CANDLEBERRY.

Of the manufactured compounds called wax, the following are the chief—viz., sealing-wax (q.v.). MODELERS' WAX, used by artists for modeling small works. It consists of equal parts of bees-wax, druggists' lead-plaster—olive oil and yellow resin—and just sufficient whiting added to produce the consistency of putty. GILDERS' WAX consists of four parts of bees-wax, well mixed by melting with one part each of verdigris and sulphate of copper.

The bees-wax of commerce is of a dirty yellow color, and mixed with many impurities. It has, consequently, to undergo a process of bleaching, by which it is rendered quite white and pure. The usual process is to melt the wax with boiling water, and stir them together for a short time, so as to separate the impurities from the wax. It is then allowed to rest for a short time, and the pure wax floats on the top; and when cold, is taken off in a cake, the lower part of which is often discolored with the dirty water. This is scraped off and mixed with the next lot to be operated upon. The purified portion is next remelted, and is then allowed to trickle from the melting-pan on to a wooden cylinder, revolving rapidly, and partly immersed in pure cold water, in a large cistern. This throws it into the water in the form of fine, thin, feather-like flakes, which cool and harden instantly in the water. When all is run off, the wax is removed from the water, and laid on linen cloths, placed on tables in a field for the air to bleach. From time to time, the flakes are turned over and examined; and when the bleaching effect of the air seems to have stopped, the wax is remelted, and converted into flakes in the cistern, and replaced in the bleaching-ground until it is quite white.

WAX, MINERAL, is a natural product known under the name of ozokerit. It used only to be found in small quantities oozing from rocks of coal formation, though near Edinburgh, candles, as curiosities, were made of it by the miners. Lately, however, immense deposits of the hydrocarbon have been found in several parts of Europe, chiefly in Galicia and Roumania, and it has now become a commercial article for the manufacture of candles. When found, it has a dark, rich-brown color, slightly greenish and translucent in thin films; but when refined, it resembles well bleached bees-wax. Its melting-point is about 60°. It is found also in Utah and California.

WAXAHACHIE, town and co. seat of Ellis co., Tex.; on the Houston and Texas Central and the Missouri, Kansas, and Texas railroads; 30 miles n. of Dallas. It has several national banks, the Park high school, electric lights, street railroads, cotton-seed oil mill, cotton compresses, and daily and weekly newspapers; is in a cotton, wheat, and corn region; and annually handles large quantities of cotton. Pop. '90, 3076.

WAX-FLOWERS. For the manufacture of wax-flowers the wax is bleached, and prepared in thin sheets of various colors, which are cut out into the shape for petals and leaves according to the kind of flower to be imitated. They are easily made to adhere, either by a slight amount of heat or a little melted wax.

WAX INSECT, *Coccus sinensis;* see COCCUS, a very small white insect, a native of China, of the same genus with the cochineal and kermes insects, and with the scale insects, which are the pest of our greenhouses, valuable on account of the wax which it produces. It is found about the beginning of June on the branches of certain trees on the juices of which it feeds, particularly on those of a kind of sumach (*rhus succedaneum*). The wax is deposited on the branches as a coating which resembles hoar-frost. This is scraped off toward the end of August, melted in boiling-water and strained through a cloth. See WAX. The Chinese wax insect has been introduced by the French into Algeria.—Another wax insect is found in South America, but is not yet well known, nor has its wax become an article of commerce.

WAX-MYRTLE. See CANDLEBERRY.

WAX-PALM, *Ceroxylon*—or *Iriartea—andicola,* a lofty palm, found in the Andes, on the eastern borders of Peru, at an elevation of 3,000 ft. and upward above the level of the sea. It grows to the height of 160 ft., and on the cicatrices of the fallen leaves, a resinous secretion is produced in great abundance, composed of about two parts of yellow resin, and one of a kind of wax, more brittle than bees' wax. This wax exudes also from the leaves, and is whitish, almost inodorous, except when heated, when it gives out a resinous odor. It is used by the inhabitants of the country in which it is produced for making candles, but is usually mixed with wax or tallow. It is probable that the wax palm would succeed well in the south of Europe, as its native climate is

not dissimilar. The usual method of obtaining the wax is by felling the tree. Each tree yields about 25 lbs. The wax is scraped off, melted, and run into calabashes. The timber of this palm is very hard and durable; the leaves are used for thatching, and the fibers for cordage. The tree is a beautiful one, with a stately stem, and a head of large pinnate leaves.—In some of the northern provinces of Brazil, wax is obtained from the carnahuba palm (q.v.).

WAX-SCULPTURE. The use of wax for sculpture is believed to be of very ancient origin; and not only have the tombs of southern Italy yielded many specimens of the portraits of the deceased modeled in wax, but many fine bronzes in antiquarian collections bear evident marks of having been modeled in wax by the process called cire-perdue. This consists in producing a model in wax, and then coating it with clay or other material in a soft state; this is allowed to harden; and the wax is then melted out by heat, and the molten metal poured in. A very fine cast of the wax-figure is thus obtained; but, of course, the wax-model of the artist is lost, after the first copy is taken; hence, such specimens are very highly prized by connoisseurs. During the 14th and 15th c., the art of modeling in wax, or ceroplastics, was much practiced, especially in Italy and in Germany, by many of the first artists, even Michael Angelo not excepted; and many of their original works in wax are still preserved. They were chiefly, however, in low relief, although very fine statuettes were also produced by men of great eminence.

WAX-TREE, *Vismia*, a genus of plants of the natural order *hypericaceæ*, having a 5-parted calyx and 5 petals, generally covered with soft hairs on the inside. All the species yield a yellow viscid juice when wounded, which, when dried, becomes somewhat similar to gamboge. The species are natives of the tropical parts of America.

WAX-WING, *Bombycilla*, a genus of birds of the family *ampelidæ*, or chatterers (q.v.), having a short, straight, elevated bill, with a very wide gape, as in the fly-catchers, but without bristles; both mandibles notched at the tip; the wings rather long, broad, and pointed; the legs short; the toes long, with sharp and curved claws. The name wax-wing is derived from a very peculiar character, which the wings exhibit; some of the secondaries and tertiaries terminating in horny expansions of the shaft, resembling small pieces of red sealing-wax. The species are few, but widely diffused over the colder parts of the northern hemisphere. The only European species is the European Wax-wing, or Bohemian Chatterer (*B. garrula*), which is found in summer in the arctic regions of Europe, Asia, and America, migrating southward in winter, sometimes as far as the shores of the Mediterranean; most abundant in America, during winter, about the great lakes and the northern part of the valley of the Mississippi. It is found also in Japan. It is only an occasional winter-visitant of Britain. In some winters, numerous flocks are seen: in other winters, and more generally, none at all. It is in severe winters that this bird is most frequently seen in Britain, and in the more southern parts of Europe. It is gregarious in winter, and the flocks are often large. It feeds on insects and worms, seeds, berries, and other fruits. It is a handsome bird, nearly as large as the song thrush; a reddish gray, with a black patch on the throat, and a black band on the forehead; the tail-coverts brownish orange; the primaries, secondaries, and tail-feathers tipped with yellow, two white bands on the wings; the lower parts silvery gray. The head is surmounted by an erectile crest of brownish orange feathers. The song of the wax-wing is a weak whistling, bearing a little resemblance to that of the thrush. It is easily tamed. The flesh is said to be delicate food.—The American Waxwing, or cedar bird (*B. cedrorum* or *Carolinensis*), is a very similar, but smaller species, found only in North America, from Canada to Central America, less migratory, and never visiting arctic regions. The general color is reddish olive, passing into purplish cinnamon in front, and into ash-color behind; the chin black; no white on the wings; the lower parts yellow. It is crested like the European wax-wing. Great flocks of cedar birds collect in the end of summer. They feed on berries, and are particularly fond of those of the red cedar. The cedar bird is extremely voracious, and when food abounds, sometimes gorges itself so much, that it may be taken by the hand, It is in much esteem for the table.—Another species is found in Japan. See illus., Larks, vol. VIII.

WAXWORK, a common name for *celastrus scandens*, a climbing shrub, also called staff tree, and shrubby bittersweet. The genus comprises about eighteen species, one in the United States, the others chiefly in Asia. *Celastrus scandens*, or shrubby bittersweet, flourishes in moist soils from Canada to South Carolina, and w. of the Mississippi river, climbing upon rocks and trees to a height of 20 ft. or more; leaves alternate, ovate-oblong, pointed, finely serrate, from 2 to 5 in. in length, dark green above, lighter below; flowers dicœcious, of a greenish color in terminal racemes. Calyx five parted, bell shaped; petals five, marginal toothed; stamens five on the edge of the calyx tube; ovary three-celled, styles united, stigma three lobed. Fruit globular, about the size of a large pea, opening by three valves when ripe. They are of a rich orange color, and when fully open, expose a beautiful crimson berry.

WAXY DEGENERATION is a morbid process in which the healthy tissue of various organs is transformed into a peculiar substance, allied in some respects to amyloid compounds, and in others to albuminous substances. Organs affected by this

degeneration have a certain resemblance in consistency and physical character to wax. They may be cut into portions of the most regular shape, with sharp angles and smooth surfaces; and the thinnest possible slices may be removed by a sharp knife for microscopical examination. Such organs are abnormally translucent, increased in volume, solidity, and weight. Usually, the first parts affected by this degeneration are the small blood-vessels, the middle or muscular coat being first changed. Subsequently, the secreting cells become similarly affected. When a solution of iodine is brought in contact with such tissues, a very deep violet red color is produced; and this deep red color is alone a sufficiently characteristic test. Although amyloid degeneration is common to many tissues and organs, the parts most frequently affected are the spleen, liver, and kidneys. This morbid condition in one or more organs is the expression of a general pathological state, the conditions and relations of which are as yet but little known.

WAY, in law, denotes the right of a person or persons to pass over land of another, or the path or road over which such right may be exercised. Ways are either private or public. A private right of way is derived by grant, express or implied. If one convey part of his land to another, and cannot reach the part reserved except over the part conveyed, a right of way over the latter is impliedly reserved. This is called a way of necessity. As to another method of obtaining a right of way, see art. PRESCRIPTION. Intermediate between public and private ways are *quasi* public ways, such for instance as the inhabitants of a t. have immemorially used from their t. to a market. Such a right cannot be now created, but must be the result of an ancient custom. A highway is created where a person has expressly or presumptively dedicated a portion of his land to the public, or it may be created by statute.

WAYCROSS, town and co. seat of Ware co., Ga.; on the Waycross Air Line and the Plant System railroads, 96 miles s.w. of Savannah. It is principally engaged in the shipment of naval stores and lumber, and has a high school, national bank, and daily, weekly, and monthly periodicals. Pop. '90, 3364.

WAYLAND, the Smith (Ang.-Sax. VELAND; old Norse, VÖLUNDR; Ger. WIELAND), was, according to the old German saga (the principal traits of which are already contained in the older Edda, but which is related in the most detailed form in the Viltinasaga), a son of the sea-giant Wate, a nephew of king Wilkinus, and of the sea-nymph Wac-hilt. His father had bound him, at first, apprentice to the celebrated smith, Mimi, then took him across the sea to the most skillful dwarfs, from whom he not only soon learned all their science, but far surpassed them.* He afterward dwelt a long time in Ulfdaler (the wolf's valley, which, by comparison with other sagas, appears to correspond to the Greek labyrinth) along with his two brothers—Eigil, the best archer, to whom the oldest form of the Tell legend attaches; and Slagfidr, whom the saga has not further characterized. The brothers here met three swan-nymphs, and lived with them for seven years, when they flew away to follow battles as Walkyries (q.v.). Afterward, Wayland came to king Nidung, who made him lame, by cutting the sinews of his feet, and put him in prison, for which Wayland revenged himself by putting the king's two sons to death, and violating his daughter Beadohild, who afterward gave birth to Wittich, a powerful champion of the German hero-legends. Wayland then flew away in a feather-robe, which he himself manufactured, and which his brother Eigil had tried first, but was precipitated to the ground. Skillfully putting together and supplementing the various old legends, Simrock has produced the saga of Wayland, as a whole, in his poem *Wieland der Schmied* (Bonn, 1835), and in the 4th part of his *Heldenbuch* (Stuttg. 1843). The legend was a favorite one among all the Germanic nations, as is shown by the frequent allusions to it in Scandinavian, Anglo-Saxon, English, and German poems, as well as by the numerous fragments yet extant in oral tradition throughout all Teutonic countries. The German poems to which the Viltinasaga appeals, which were in existence up to the 13th c., have been utterly lost. Even beyond the bounds of Germany, old French poems and traditions tell of Gallans the smith. See Depping and Michel, *Veland le Forgeron* (Par. 1833). The legend of Wayland is in fact one of those myths common to the Indo-Germanic family. Besides the German tradition, it is found most distinctly among the Greeks, in the different stories of Dædalus, Hephæstus, Erichthonius, etc. Next to Jacob Grimm's profound discussion in the *German Mythology*, Kuhn has pointed out in the best manner the signification and ramifications of the myth in his treatise, *Die Sprachvergleichung und die Urgeschichte der Germ. Völker*, in the *Zeitschrift für vergleichende Sprachforschung* (vol. iv., Berl. 1854).

WAYLAND, FRANCIS, D.D., LL.D., 1796–1865, b. New York, of English parentage; graduated at Union college, 1813; studied medicine and commenced the practice of it at Troy, but having joined the Baptist church in 1816 and devoted himself to the ministry, studied theology at Andover seminary; was tutor in Union college, 1817–21; pastor of First Baptist church, Boston, 1821–26; pres. of Brown university, 1827–55; after which was pastor of First Baptist church, Providence. He was celebrated as an instructor, preacher, and writer—a man of great wisdom and self-devotion. Among his published works are, *Elements of Moral Science; Elements of Political Economy; Elements of Intellectual Philosophy; Christianity and Slavery; Limitations of Human Responsibility; Life of Adoniram Judson, D.D.; Thoughts on the Present Collegiate System in the United States.* This last led, in 1849, to the adoption of the voluntary system at Brown university. His life has been written by his sons.

* The name Wayland is from a root signifying art, cunning; from which come Eng. *wile* and (through old Fr.) *guile.* Ang-Sax. *velan* means to fabricate.

WAYMOUTH, George, b. England, 1570; accompanied sir Fernando Gorges on an expedition along the Atlantic coast of North America, sailed up the Penobscot and Kennebec rivers, and persuaded some of the natives to return with him to England. In 1605, there was published, *A True Relation of the most Prosperous Voyage made this present year, 1605, in the Discovery of the Land of Virginia, and 60 miles up a most Excellent river, by Capt. George Waymouth, written by James Rosier, a Gentleman employed in the Voyage.*

WAYNE, a co. in s.e. Georgia, bounded on the n.e. by the Altamaha river, drained by the Satilla; 721 sq.m.; pop. '90, 7485. Co. seat, Jesup.

WAYNE, a co. in s. Illinois, drained by the Little Wabash river, the Skillet fork, and Elm creek; 720 sq.m.; pop. '90, 23,806. Co. seat, Fairfield.

WAYNE, a co. in e. Indiana, intersected by numerous railroads; 380 sq.m.; pop. '90, 37,628. Co. seat, Richmond.

WAYNE, a co. in s. Iowa, drained by the Chariton river, forming its n.e. border, the South Fork, and two branches of Locust creek; 525 sq.m.; pop. '90, 15,670. Co. seat, Corydon.

WAYNE, a co. in s. Kentucky, drained by the Cumberland river and its branches, 590 sq.m.; pop. '90, 12,852. Co. seat, Monticello.

WAYNE, a co. in s.e. Michigan, drained by the Huron, Rouge, and Detroit rivers, the latter, with lake St. Clair, forming its e. boundary, having lake Erie on the s.e.; 565 sq.m.; pop. '90, 257,114. Co. seat, Detroit.

WAYNE, a co. in s.e. Mississippi, 775 sq.m.; pop. '90, 9817. Co. seat, Waynesboro.

WAYNE, a co. in s.e. Missouri, drained by the Big Black, Castor, and St. Francis rivers; 800 sq.m.; pop. '90, 11,727. Co. seat, Greenville.

WAYNE, a co. in n.e. Nebraska, drained by affluents of the Elkhorn river; 444 sq.m.; pop. '90, 6169. Co. seat, Wayne.

WAYNE, a co. in w. New York, having lake Ontario for its n. boundary; 621 sq.m.; pop. '90, 49,729. Co. seat, Lyons.

WAYNE, a co. in central North Carolina, intersected by the Neuse river; 615 sq.m.; pop. '90, 26,100. Co. seat, Goldsboro.

WAYNE, a co. in central Ohio; 540 sq.m.; pop. '90, 39,005. Co. seat, Wooster.

WAYNE, a co. in n.e. Pennsylvania, having the Delaware river for its n.e. and e. boundary; 738 sq.m.; pop. '90, 31,010. Co. seat, Honesdale.

WAYNE, a co. in central Tennessee; 720 sq.m.; pop. '90, 11,471. Co. seat, Waynesboro.

WAYNE, a co. in s.w. West Virginia, having the Ohio river for its n. boundary; 445 sq.m.; pop. '90, 18,652. Co. seat, Wayne.

WAYNE, Anthony, an American general of the war of the Revolution, was born at Easttown, Penn., Jan. 1, 1745. His grandfather, a native of Yorkshire, commanded a squadron of dragoons at the battle of the Boyne, and emigrated to Pennsylvania. Anthony was educated at Philadelphia; at the age of 18, he was employed as a land-surveyor, and was selected by Benjamin Franklin to form a projected settlement in Nova Scotia. At the beginning of the American revolution (1775), he was married and settled on a farm in Pennsylvania, taking an active interest in politics, and became a member of a committee of safety, and studied military drill and tactics. At the outbreak of hostilities, he raised a regiment of volunteers, of which he was appointed colonel, and sent to Canada; where he covered the retreat of the provincial forces at Three Rivers. He commanded at Ticonderoga until 1777, when he was made brig.gen., and joined Washington in New Jersey; commanded the rear-guard in the retreat at Brandywine; led the attack at Germantown; captured supplies for the distressed army at Valley Forge; distinguished himself at Monmouth; was defeated at Paoli; but achieved the most brilliant victory of the war in the storming of Stony Point (q.v.), July 15, 1779. His courage and skill saved Lafayette in Virginia, 1780; and he aided in the siege of Yorktown, and commanded in Georgia. At the close of the war, rewarded by popular enthusiasm, and having, by his dash and audacity, acquired the sobriquet of "Mad Anthony," he retired to his farm at Waynesborough, and engaged in promoting the construction of roads and canals. In 1792, he commanded a successful expedition against the Indians of the north-western territories; where he remained, until 1796, as U. S. commissioner. He died at the garrison at Presque Isle (now Erie), Dec. 14, 1796.

WAYS AND MEANS, Committee of, a committee of the house of commons appointed to determine the modes of raising the money which the house—after resolutions reported from the committee of supply, and agreed to—has granted to the crown. Like the committee of supply, it is always a committee of the whole house. A chairman, elected by the committee of supply, but known as the chairman of the committee of ways and means, presides over both committees. One of the most important occasions for which the committee sits is to receive the budget, or annual financial statement of the year from the chancellor of the exchequer. The propositions of the government

regarding loans, duties, taxes, tolls, and any other means for raising revenue, are submitted to the consideration of the committee of ways and means in the shape of resolutions. The amount proposed to be raised must not exceed the sum granted in the committee of supply; and the chancellor of the exchequer is bound to satisfy the house, by a detail of the sums granted for the several services, that the amount of these sums will be a sufficient justification, in point of quantity, to the committee of ways and means to adopt such measures and impose such taxes as shall then be recommended. Such resolutions as are agreed to are adopted and embodied in bills, and in due time become law. See PARLIAMENT (*Supplies*).

In the United States this committee is a committee appointed from among the members of the house of representatives, by the speaker, to consider all proposed legislation or other matters relating to the revenue and the bonded debt of the U. S. The term is borrowed from British parliamentary usage. The first committee of W. and M. in the house of reps., was appointed, 1789; in 1795 it became a standing committee. The number of members, originally seven, was gradually increased to thirteen. Until 1865 the committee also considered the question of appropriations, but in that year this business was transferred to the committee on appropriations. Though it has thus been shorn of much of the power which formerly made its chairman the leader of the house of representatives, it is still a very important body, and its chairmanship is looked upon as the highest office in the gift of the speaker. The corresponding body in the senate is the finance committee, established, 1816; and measures reported by either committee obtain precedence over all other business.

WAYWODE, see WOJWODA.

WEAK FISH, the *cynoscion regalis*, a common fish of the family sciænidæ, abounding along the Atlantic coast of the United States. It has a pale, brownish color above, with a greenish tinge, grading into silvery along the sides and belly, and a variegated mottling with brown vermicular blotches. It is from 1 to 2 ft. long and is purely a salt-water fish; and from its shape and habit of taking the hook is in some places called salt-water trout.

WEAKLEY, a co. in w. Tennessee, drained by branches of the Obion river; 620 sq.m.; pop. '90, 28,955. Co. seat, Dresden.

WEALDEN FORMATION, a series of fresh-water strata belonging to the lower cretaceous epoch. Having been originally studied in the parts of Kent, Surrey, and Sussex called the Weald, this local name was given to the formation. It has been divided into two series, which do not differ very materially from each other, viz., Weald clay, 560 ft.; Hastings sand, 740; total 1300. The Weald clay consists of blue and brown clay and shale with thin beds of sandstone and shelly limestone. These strata were probably lake or estuary deposits, and contain the remains of the land flora and fauna, often in great abundance. The beds of limestone called Sussex marble, are almost entirely composed of a species of *paludina*, not very different from the common *P. vivipara* of English rivers. The clays are often laminated by thin layers, consisting of immense numbers of the shells of minute *cyprides*. But the most remarkable animal remains are those of the huge reptiles which lived on the land, tenanted the air, or abounded in the sea, such as the iguanodon (q.v.), hyleosaurus (q.v.), pterodactyl (q.v.), and the numerous species of turtles which have been described from these strata. The vegetable fossils belong chiefly to ferns, and to the gymnospermatous orders of conifers and cycads; the fruits of several species of both orders have been found; and in some places the rolled trunks of *endogenites* and *clathraria*, belonging to cycads, and of different species of coniferous wood, occur in enormous quantities, as at Brook Point, in the Isle of Wight, where the shore at low water is strewn with them.

The Hastings beds contain more sandstone and less clay than those of the upper Weald clays. The picturesque scenery of the High Rocks and other places in the neighborhood of Tunbridge, is weathered out of the beds of white sandstone belonging to this period. The remains of the huge Wealden reptiles abound in the sandstones of this division. The Tilgate forest-beds, where Dr. Mantell first found the iguanodon, and the rocks in the neighborhood of Hastings, are the best-known repositories of those remarkable fossils.

The deposition of the Wealden beds was followed by a gradual depression of the land when these fresh-water deposits were covered by the estuary beds of the newer *greensand*. The depression continued until the fresh-water and estuary strata formed the bottom of a deep sea, on which were deposited the immense beds of chalk and allied strata which form the bulk of the cretaceous series.

WEALTH, as a concept of political economy, means the stock of useful things, having value. For a discussion of some misleading uses of the term, see the article MONEY; and for an explanation of the economic theories in regard to utility and value, see VALUE. See also the article CAPITAL.

WEANING AND FEEDING IN INFANCY. The propriety of mothers nursing their own children is now so universally acknowledged, that it is the duty of the physician

less frequently to urge maternal nursing than to indicate those cases in which it becomes necessary to substitute another mode of rearing the infant. "Women," says Dr. Maunsell, "who labor under any mortal or weakening disease—as phthisis, hemorrhages, epilepsy—are obviously disqualified from the office of nurse. Some who are in other respects healthy, have breasts incapable of secreting a sufficient supply of milk. In other instances, the breast may perform its functions well, but the nipple may be naturally so small, or may be so completely obliterated by the pressure of tight stays, as not to admit of its being laid hold of by the child. These are actual physical hindrances to nursing. Again, women may, and, in the higher classes, frequently do, possess such extremely sensitive and excitable temperaments, as will render it imprudent for them to suckle their own children. Frightened and excited by every accidental change in the infant's countenance, and inordinately moved by the common agitations of life, such persons are kept in a state of continual fever, which materially interferes with the formation of milk both as to quantity and quality. Women, also, who become mothers for the first time at a late period of life, have seldom the flexibility of disposition or the physical aptitude for the secretion of milk, required to constitute a good nurse."—*A Treatise on the Management and Diseases of Children*, 4th ed., 1842, pp. 39, 40. In ordinary cases, the child should be put to the breast as soon as the latter begins to contain anything; and when the secretion of milk has fairly commenced, it will require no other food until the seventh or eighth month, provided the mother be a good nurse. During the first five or six months, the infant should be put to the breast at regular intervals of about four hours; afterward, when the teeth are beginning to appear, the child need not suck more than four times in the twenty-four hours, some artificial food being given to it twice during the same period. This at first may consist of soft bread steeped in hot water, with the addition of sugar and cow's milk; and subsequently a little broth, free from salt and vegetables, may be given once a day. The spoon is now the best medium of feeding, as the food should be more solid than could be drawn through the sucking bottle. The time of weaning should be that indicated by nature, when, by providing the child with teeth, she furnishes it with the means of obtaining its nourishment from substances more solid than milk. If the infant has been gradually accustomed to a diminished supply of maternal and an increase of artificial food, weaning will be a comparatively easy process; and much of that suffering both to parent and child will be spared, which commonly ensues when a sudden change is made. In ordinary cases, the period of weaning varies from the seventh to the twelve month; sometimes the child is kept to the breast for a much longer period, from the popular idea that lactation prevents pregnancy, but such unnaturally prolonged lactation is usually injurious to both mother and child.

In those cases in which it is inexpedient or impossible for a mother to suckle her own child, the choice of a wet-nurse becomes a subject of much importance. Upon this subject, Dr. Maunsell lays down the following important practical rules: "The great thing we have to look to is to ascertain that both the woman and her child are in good health; and of this we must endeavor to judge by the following signs: The woman's general appearance and form should be observed, and they ought to be such as betoken a sound constitution. Her skin should be free from eruptions; her tongue clean, and indicating a healthy digestion; her gums and teeth sound and perfect; the breasts should be firm and well formed—not too large or flabby—and with perfect, well-developed nipples. We should see that the milk flows freely, upon slight pressure; and we should allow a little of it to remain in a glass in order that we may judge of its quality. It should be thin, and of a bluish-white color; sweet to the taste; and when allowed to stand, should throw up a considerable quantity of cream. A nurse should not be old, but it is better that she should have had one or two children before, as she will then be likely to have more milk, and may be supposed to have acquired experience in the management of infants. Having examined the mother, we must next turn to the child, which should be well nourished, clean, and free from eruptions, especially on the head and buttocks. We should also carefully examine its mouth, to ascertain that it is free from sores or aphthæ. If both woman and child bear such an examination, we may with tolerable security pronounce the former to be likely to prove a good nurse."—*Op. cit.* pp. 44, 45. In one respect, we differ from this eminent physician. He holds that "the more recently the nurse's own confinement has taken place, provided she has recovered from its effects, the better." Supposing a nurse is required for a new-born infant, this rule holds good; but provided a nurse is required for an infant of three or four months old (for example), it is preferable to obtain a nurse whose milk is of that age. We believe it to be a general physiological law that the age of the milk should correspond to the age of the infant; that is to say, that an infant taken at any given age from its mother, before the normal period of weaning, should be provided with a nurse who was confined about the same time as its own mother.

A wet-nurse should be very much preferred to any kind of *artificial feeding;* but peculiar cases may occur in which it is impossible to procure a nurse; or an infant whose mother is incapable of nourishing it may be the subject of a disease that may be transmitted through the infant to the nurse. In these cases, a food must be provided as nearly as possible resembling the natural food; and this is naturally sought for among the food of animals. The milk of the cow is most commonly used, in consequence of its being

the most easily obtained; but ass's milk more nearly resembles human milk, as is shown from the following comparative analyses by Professor Playfair:

	Woman.	Cow.	Ass.
Caseine	1.5	4.0	1.9
Butter	4.4	4.6	1.3
Sugar	5.7	3.8	6.3
Ashes	0.5	0.6	...
Water	88.0	89.0	90.5

The most important difference between cow's milk and woman's milk is the great excess of caseine in the former. The former fluid may, however, be made to resemble the latter in composition in either of the following ways: (1) On gently heating cow's milk, a membrane of caseine forms on the surface; by removing two or three of these membranes as they form, we can reduce the quantity of caseine to the desired extent; or (2) we may dilute cow's milk with twice its bulk of pure water, and add a little sugar. This food should be administered at a natural temperature (of about 98°) through a sucking-bottle; and as the child grows older, it will soon be able to take natural cow's milk without inconvenience. The nature and importance of the mixture of milk and farinaceous food known as Liebig's soup for children, are described under Soup.

The rules regarding the times, etc, of feeding are similar to those laid down for suckling. Assuming that the infant, whether brought up at the breast or artificially reared, has been safely weaned, we have to consider what rules should be laid down regarding its food subsequently. For some months after weaning, the food should consist principally of semi-fluid substances, such as milk thickened with baked flour, or pap, to which a little sugar should be added. Light broths may also be administered, especially in the occasional cases in which milk seems to disagree; and bread and butter may be tried in small quantity. We shall conclude this article with the following "model of a suitable diet for children," which cannot be too strongly impressed upon the minds of all young mothers: "A healthy child, of 2 or 3 years old, commonly awakes hungry and thirsty at five or six o'clock in the morning, sometimes even earlier. Immediately after awaking, a little bread and sweet milk should be given to it, or (when the child is too young to eat bread) a little bread-pap. The latter should be warm; but in the former case, the bread may be eaten from the hand, and the milk allowed to be drunk cold, as it is well at this meal to furnish no inducement for eating beyond that of hunger. After eating, the child will generally sleep again for an hour or two; and about nine o'clock it should get its second meal, of bread softened in hot water, which latter is to be drained off, and fresh milk and a little sugar added to the bread. Between one and two, the child may have dinner, consisting, at the younger ages, of beef, mutton, or chicken broth (deprived of all fat), and bread. When a sufficient number of teeth are developed to admit of chewing being performed, a little animal food, as chicken, roast, or boiled mutton, or beef, not too much dressed, should be allowed, with a potato or bread, and some fresh, well-dressed vegetable, as turnips or cauliflower. After dinner, some drink will be requisite; and a healthy child requires, and indeed wishes for nothing but water. Light, fresh table-beer would not be injurious to a child of 4 or 5 years old, but it is unnecessary. Between six and seven o'clock, the child may have its last meal of bread steeped in water, etc., as at nine o'clock in the morning. A healthy child which has been in the open air during the greater part of the day, will be ready for bed shortly after this last supply, and will require nothing more till next morning. Similar regimen and hours may be adopted throughout the whole period of childhood; only as the fourth or fifth year approaches, giving, for breakfast and supper, bread and milk without water, and either warm or cold, according to the weather or the child's inclination. The supply of food upon first awaking in the morning may also be gradually discontinued, and breakfast be given somewhat earlier." See Sterilized Food.

WEARE, Meshech, 1713–86; b. N. H.; graduated at Harvard, 1735; studied law and carried on a successful practice. He was a member and speaker of the colonial legislature, commissioner at the Albany colonial congress, 1754; chief-justice of the N. H. supreme court in 1777; and president of the state from 1776 until the end of the war, and again in 1784. He displayed great vigor during the revolution in raising and equipping troops.

WEASAND is a name sometimes given to the windpipe or trachea (q.v.).

WEASEL, *Mustela*, a genus of quadrupeds of the family *mustelidæ* (q.v.), having a very elongated body; short feet, with toes quite separate, and sharp claws; four molar teeth on each side above, and five below. The Common Weasel (*M. vulgaris*) is a native of almost all the temperate and cold parts of the northern hemisphere, except the most arctic regions. Its range does not extend quite so far n. as that of the ermine. It is the smallest of the *mustelidæ* of the old world, not exceeding 2½ in. in height, and 7½ in. in length, from nose to tail; the tail about 2½ in. long, and terminating in a point, not so bushy as that of the stoat or ermine. The female is smaller than the male. The head is large; the ears short, broad, and rounded, the whiskers long. The color is reddish-brown on the upper parts, sides, legs, and tail; the throat and belly white. The eyes are small, round, and black, with a very keen expression, to which the whole habits of the animal correspond. It is nimble and active, bold, and yet wary. It may often be seen peeping curiously from a hole in a wall,

but vainly does the school-boy attempt to strike it with a stone. Catching it is out of the question for him, and so far well, for it is ready to bite severely. It is a most persevering hunter, its scent as keen as its sight, quarters the ground like a dog, and wearies out animals larger and apparently much stronger than itself. It preys on mice, rats, voles, small birds, and other small animals, sometimes even on hares and rabbits, robs birds' nests, devouring the young birds or sucking the eggs, and is occasionally troublesome in poultry-yards, killing young chickens. It climbs walls and trees with great agility, and does not hesitate to plunge into water in pursuit of the water-rat. It sometimes begins by abstracting the blood of the animal which it has killed, and generally devours the brain; but when food is abundant, it carries the body to its retreat, where a considerable quantity of prey is often found, the weasel preferring to eat it in a half-putrefied state. The weasel generally sleeps during the day, and is most active at night. It has a disagreeable smell, which is strongest in hot weather, or when it has been pursued or irritated. It is capable of being tamed when taken young, and becomes docile and gentle. The female weasel makes a nest of straw-leaves and moss for her young which are produced in spring, four or five in a litter; often in a crevice of a bank, or in a hollow tree. The fur of the weasel is an article of commerce in some northern countries, and weasel-skins are exported in considerable quantity from Siberia to China. The weasel sometimes, but rarely, becomes white in winter, like the ermine.—The ermine (q.v.), or stoat, is another species of weasel.—America has several species of weasel, of which one (*M. pusilla*) is rather smaller than the common weasel of Europe, and has a shorter tail. It is abundant in the northern parts of the United States, and its range extends far to the north. In the United States, it remains brown all winter; but in the fur-countries it becomes white. See illus. Whale, etc., vol. XV.

WEATHER is the condition of the atmosphere at any time in respect of heat, moisture, wind, rain, cloud, and electricity; and a change of weather implies a change in one or more of these elements. From the direct bearing weather-changes have on human interests, they have from the earliest times been closely watched, so that the causes by which they are brought about may be discovered, and their approach predicted with some confidence. The craving in the public mind for this knowledge is strongly attested by the weather prognostics of every language, which, with much that is shrewd and of considerable value, embrace more that is vague, and not a little positively absurd.

It is not necessary here to refer to Moore, Zadkiel, and other almanac-makers of that class, except as proving by their mere existence a wide-spread ignorance of even the most palpable elements of physical law. Prognosticators of higher pretensions repeatedly appear before the public, and it is curious to note how their predictions are laid hold of by the newspapers, and scattered broadcast over the country. Among this class was Mathieu de la Drome, whose predictions of storms and rains made so much noise, that the emperor Napoleon requested the celebrated Leverrier to examine the grounds on which his predictions were founded. The exposure was complete. One of his principal predictions was based entirely on a high *average* of the rain-fall at a particular season. On examining the rain-fall of the particular years from which the average had been taken, it was found that the excess was entirely due to an unprecedentedly heavy rain which occurred in one of the years at that season. One of the most remarkable predictions of recent times was made by an Irish nobleman in reference to Sept., 1865, which turned out to be in accordance with the prediction—dry, warm, and fine, beyond precedent for that month. The celebrity of this prediction has, however, been greatly reduced by other predictions made since, which the event did not verify.

The changes of the moon were long, and in many minds still are, regarded as supplying the elements of prediction. In order to test the real value of the moon's changes on the weather, the Greenwich observations of 50 years were carefully examined, and it was found that the number of instances in which the weather was in accordance with the prognostication was one instance less than those in which the weather was different. When brought to the test of accurate examination and figures, the theory of the moon's changes on the coming weather is by this, as well as by similar investigations of old records of the weather, proved to be a delusion; but since most people have a bias toward forgetting the unsuccessful and remembering the successful prognostications, the theory may continue to be accepted, until a sounder knowledge of the natural laws are more generally diffused.

For some years Mr. Thomas du Boulay predicted the general character of the weather of each summer from the weather-conditions which prevailed during the week of the spring equinox preceding, supposing that the general character of the weather of the next six months is already settled, and that it only requires the necessary skill to read its features, since these will remain generally constant till autumn. For a few years he speculated in grain on the faith of the predictions, which turned out pretty correct. Latterly, however, his predictions were not verified.

The truth is, that no prediction of the weather can be made, in the British islands at least, for more than about two days beforehand. Any attempt at a longer prediction is illusory. We would here refer to the article Storms, as showing the possibility and mode of making real predictions of the weather. Almost all the weather-changes of Europe begin from

westward, and pass over Great Britain, following a generally easterly course. Unsettled or bad weather is accompanied with a low barometer; elsewhere, the barometer is higher. Suppose that from weather-telegrams received, it is seen that everywhere in Europe barometers are high, no storm is imminent and generally none is likely to happen for about two days at least. But if, on the following morning, barometers begin to fall a little in the west of Ireland, and an easterly wind begins to blow over Great Britain and Norway, and a s.e. wind over France; then, seeing the winds blow toward the lowest barometer, or rather a little toward the right of it, the presumption is that a storm of greater or less severity is coming up, the center of which is likely to pass over England. This ought, therefore, to be closely watched; and if the winds keep in nearly the same direction, or veering slowly toward the s. and w., increase in force, and barometers in the west of Ireland fall rapidly, a great storm is portended, of the approach of which warning should be at once issued. But if, on the contrary, the winds do not increase in force, and the barometer fall only slightly, or cease to fall, the storm has either passed considerably to the n. of the British islands, or its approach will be delayed for some time; and hence no immediate warning may be necessary.

It is our proximity to the Atlantic that makes it impossible to predict the weather beyond two days at the utmost. In Norway and the Baltic, and places toward the east of Europe, the weather may be predicted for a longer time owing to the more easterly situation of these places. In America also, where storms advance chiefly from w. to e., gales and unsettled weather are predicted to places on the sea-board in the east some days before.

The collecting of this information by the telegraph is a work which, owing to the expense, governments only can accomplish; and from its public importance, it is an incumbent duty which they should discharge for the benefit of the sea-faring and agricultural population. A good deal may, however, be done by each one for himself, by observing his barometer, the winds, and the face of the sky—especially the cirrus cloud—the most elevated and delicate of the clouds. But ere these simple observations can be turned to account, and made the basis of an intelligent prediction, some knowledge of the general features of storms (q.v.) is indispensable. These specially—(1) Storms have a circular area; and (2) advance in an easterly direction, bearing a low barometric pressure with them. (3) Winds blow from a high to a low barometer, the observer, standing with his back to the wind, having always the low barometer to his left in the northern hemisphere, and (4) with a force proportioned to the difference of the pressure, or to the steepness of the barometric gradient. (5) Storms are first noticed in the upper regions of the atmosphere, or in the region of the cirrus cloud. (6) In front of the storm the air is warm and humid; in the rear of it, cold, or cool and dry. With such observations, requiring only a barometer intelligently interpreted, particularly if hills form part of the landscape, the character of the weather may be foreseen for one day, or even on occasions longer.

To the agriculturist and horticulturist, not high winds but hails, heavy rains, frosts and fine weather are what are required to be known. Such forecasts have been issued by the signal service officer in the United States, were also begun in France by Leverrier shortly before his lamented death, and are gradually being introduced over the continent of Europe, with great advantage to those national interests. But though no prediction of the weather for weeks or months beforehand can be made with any pretensions to trustworthiness, yet guesses or surmises may be formed not without some value. All observation goes to prove that predictions based on solar or other astronomical causes are without foundation, and that averages based on terrestrial observations are the only guides in the matter. Of this class are the interruptions which occur in the regular march of temperature in the course of the year. Thus, cold weather generally prevails from the 11th to the 14th of April—that is, the period of the "borrowing days" (O.S.), and in the second week of May; and these, with some other cold and warm periods,* are almost co-extensive with the northern hemisphere of the globe. Hence, then, at these times, when the weather becomes cold or warm, it may be predicted that such weather will last for several days. Again, if, after a long-continued prevalence of s.w. winds, the n.e. wind should set in, it is highly probable that easterly winds will prevail for some time; so that, if the season be winter, a continuance of frost, and perhaps snow, may be looked for; but if midsummer, the weather will become dry, warm, and bracing, But suppose easterly winds have been unusually predominant in autumn, and

* I have examined the temperature of Scotland for a number of years and have shown (*Jour. of Scot. Meteorolog. Soc.*, Nos. xiii., xiv., xvi.) that the following interruptions occur from year to year with very rare exceptions, in the annual march of the Scottish temperature:

Six cold periods	1. 7th to 10th February. 2. 11th to 14th April. 3. 9th to 14th May. 4. 29th June to 4th July. 5. 6th to 11th August. 6. 6th to 12th November.
Three warm periods	1. 12th to 15th July. 2. 12th to 15th August. 3. 3d to 9th December.

Buchan's Handy Book of Meteorology.

south-westerly winds begin to prevail in the end of November or the beginning of December, it is most probable that the weather will continue exceptionally mild, with frequent heavy storms of wind and rain till about Christmas.

A good beginning has been made in India by Mr. Blanford in predicting the character of the monsoon season, it having been shown by him that abnormal distributions of atmospheric pressure which happen to prevail about its commencement, tend to perpetuate themselves during the season. Since the distribution of the rains depends on the distribution of atmospheric pressure, forecasts of the coming monsoon have been issued, which thus proceed from a scientific basis, and the event has shown them to have been remarkably successful. It may be predicted that as systematic observation advances, the power to predict the character of the coming season will be extended to higher latitudes. See METEOROLOGY, WIND, SIGNAL SERVICE.

WEATHERING, a slight inclination given to the top of a cornice or molding, to prevent water from lodging on it.

WEAVER-BIRD, *Ploceus*, a genus of bird of the finch family (*fringillidæ*), of a group or sub-family (*ploceinæ*), to most of which the name weaver-bird is extended. The name has reference to the remarkable structure of the nests of these birds, which are woven in a very wonderful manner of various vegetable substances, and are objects of great interest. The *ploceinæ* are natives of the warmer parts of Asia, of Africa, and of Australia; none being found in Europe nor in America. The species are numerous. They are small birds, with a strong conical bill, the ridge of which is slightly curved, the tip entire. The claws are large and very long. The wings are pointed, the first quill remarkably short. There is great diversity in the form and appearance of the nests constructed by different species. One of the best-known species is the PHILIPPINE WEAVER (*P. Philippinus*), the baya (q.v.) of India. Many of the other weaver-birds construct nests pretty much on the same plan with this—pouches elongated into tubes, entering from below; those of some are kidney-shaped, and the entrance is in the side. They very generally suspend their nests in the same way from the extremeties of branches, and often prefer branches which hang over water, probably as affording further security against monkeys, squirrels, snakes, and other enemies. Social habits are very prevalent among them, and many nests of the same species are often found close together. Some of them attach the nest of one year to that of the year preceding, as the *ploceus pensilis* of Madagascar, which sometimes thus makes five nests in succession, one hanging to another. Some of the African species build their nests in company, the whole forming one structure. Thus, the SOCIAL or REPUBLICAN weaver-bird of South Africa (*ploceus socius* or *philotærus lepidus*) constructs a kind of umbrella-like roof, under which 800 or 1000 nests have been found, the nests like the cells of a honeycomb, and arranged with wonderful regularity. An acacia with straight, smooth stem, such as predaceous animals cannot easily climb, is often selected by the bird-community. When the situation is chosen, the birds begin by constructing the roof, which is made of coarse grass, each pair afterward building their own nest, which is attached to the roof. As new nests are built every year, the weight of the structure often becomes so great as to break down its support. *Textor erythrorhynchus* is a bird of the weaver group, which is commonly seen in South Africa accompanying herds of buffaloes, and feeding on the bots and other insects which infest them, alighting on their backs to pick them out of the hide. The bird is often of great use to the buffalo in another way, by giving warning of the approach of an enemy. The whydaw birds (q.v,) or widow birds, likewise belong to the group of *ploceinæ*.

WEAVING, the art by which threads or yarns of any substance are interlaced so as to form a continuous web. It is perhaps the most ancient of the manufacturing arts, for clothing was always a first necessity of mankind. The methods by which weaving is now accomplished have been explained under loom (q.v.); it therefore only remains to describe the variations which may be effected by ingenious applications of the powers of the loom; and as these are almost endless, some of the more common and easily understood will be chosen. The simplest form of weaving is that employed in making the mats of uncivilized nations. These consist of single untwisted fibers, usually vegetable, arranged side by side to the width required, and of the length of the fibers themselves, which are tied at each end to a stick, which is so fixed as to keep the fiber straight, and on the same plane. Then the weaver lifts up every other of these longitudinal threads, and passes under it a transverse one, which he first attaches by tying or twisting to the outermost fiber of the side he commences with, and afterward in the same way to that on the other side, when it has passed through the whole series. The acquisition of the art of spinning threads of any length enables more advanced nations to give great length to the warp, or series of threads which are first arranged, and to pass the weft or transverse thread backward and forward by means of a shuttle, without the necessity of fixing at the sides. The mechanical appliances already described under LOOM aid these operations to an amazing extent. That kind of weaving which consists of passing the weft alternately over and under each thread of the warp is called *plain* weaving; but if the weaver takes up first one and then two threads alternately of the warp series, and passes the weft under them for the first shoot of his shuttle, and raises those which were left down before for the second shoot, he produces a cloth with a very different

appearance, called twill (q.v.), many varieties of which may be produced by varying the numbers missed or taken up—as, for example, one and three, instead of one and two.

There are few arts which require more patience or skill than weaving. As many as from one to two thousand threads often constitute the warp; and these threads may be so varied in quality (see YARN) as to produce many varieties of fabric. From that cause alone there are almost infinite variations. Many may be produced by the order in which the threads are lifted for the passage of the weft—that of itself can also vary as much or more in its quality and other circumstances, so that the inventive genius of the weaver finds incessant opportunities for its display, and nice arithmetical calculations are required in estimating and allotting the numerous threads to the endless variety of patterns which are constantly passing through the looms. A really practical knowledge of weaving can only be obtained by working with looms, and studying such technical treatises as Watson's *Theory and Practice of the Art of Weaving*, and some of the elaborate treatises by the French weavers.

There is no branch of manufacture in which inventions and improvements are more rapidly succeeding each other than in weaving; but, as a rule, they are of minor importance, and rarely affect the general principles of the process. In 1867, however, the novelty of *convex* weaving by machinery was introduced, and although only at present applied to one or two purposes, seems to promise a wide application to clothing generally, and many other purposes.

Out of the numerous attempts that have been made during the last ten years to weave by machinery a convex surface, such as is required in several articles of clothing, hardly one, up to the present time, has succeeded. This failure has been owing partly to deficiencies in the various inventions of this kind, and partly to the costliness of carrying them out. At last, after long and patient trials, a patent convex weaving-loom has been invented that not only answers all the purposes of the hand loom, hitherto exclusively used, but also possesses the advantage, which is absolutely necessary in a country where labor is scarce, of doing ten times the amount of work in the same space of time. With the hand-loom, one man can make, at the very utmost, only four pair of stays in a day, whereas the new-invented convex weaving machine turns out 40 pair daily. The superior lightness and flexibility of woven stays, and their perfect freedom from hard seams, have increased to a very large extent the demand for this class of goods. Up to the present moment, hand-labor alone has been employed in France and Würtemberg, two countries where they have been most extensively manufactured. In the United States, however, where the high wages for hand-labor have necessitated the most extensive use of machinery, this system could not be adopted with any possibility of pecuniary success; and, in consequence of this fact, a loom for weaving of stays and other convex goods had to be invented. This loom, which was constructed under the superintendence of M. Opper, for the convex weaving company in New York, does the work automatically and to perfection.

The principle of a constant length of travel for the shuttle was adopted for the sake of simplicity; but, as it is necessary, in weaving the gores, that the weft-thread should pass through only a part of the breadth of the warp, the Jacquard has been employed for the purpose of taking up the portion of the warp required to be woven in that part. It is impossible by mere verbal description to give any adequate notion of this ingenious machine without seeing it in operation.

Bonelli's loom is an ingenious attempt to substitute for the costly perforated cards of a Jacquard loom an endless band of paper covered with tinfoil, on which the required pattern is traced with a varnish, rendering the parts thus covered non-conducting. This band of paper passes under a series of thin metallic teeth, each connected with a small electro-magnet, and these magnets act on a series of small pistons. According as these teeth come in contact with the metallic surface or the varnish, so is a series of holes in a perforated plate closed or opened when an electric current is passing. The perforations in the plate correspond to the punched holes in the cards of a Jacquard, and act in the same way upon its needles. See JACQUARD LOOM. Bonelli's loom, though it was perfect enough for practical work in 1860, has not yet been brought into use. It is fully described in the *Society of Arts' Journal*, Jan. 6, 1860.

WEBB, a co. in s. Texas, having the Rio Grande for its w. boundary, separating it from Mexico; 1680 sq.m.; pop. '90, 14,842, of American birth, with colored. Co. seat, Laredo.

WEBB, ALEXANDER S., b. N. Y., 1835; educated at West Point, and appointed to the artillery. He was stationed in Florida and on the frontier, and was for 4 years assistant professor of mathematics at West Point. At the beginning of the war of the secession he aided in the defense of Fort Pickens. He was at the first battle of Bull Run, was attached to the army of the Potomac in the peninsula campaign of 1862, and was appointed brig. gen. of volunteers in 1863. At Gettysburg he led a brigade, where he was wounded. In 1864 he commanded a brigade in the battles of the Wilderness, and was dangerously wounded. Returning to the service early in 1865, he was Meade's chief of staff till the close of the war. Since 1869 he has been president of the college of the city of New York. He has published *The Peninsula; McClellan's Campaign of 1862* (1882), and has written magazine articles on war topics.

WEBB, Charles Henry, b. N. Y., 1834. When a young man he visited California, and was the founder and editor of *The Californian*. He has since written sketches and humorous articles under the pseudonym of "John Paul." He has also written several burlesque dramas, and is the inventor of an "adding machine."

WEBB, George James, b. Mass., 1805; an eminent composer and teacher of music, professor for several years in the Boston academy of music. He has published *American Glee Book; Common School Songster; The Vocal Class Book for Schools; Massachusetts Collection of Psalmody; Orthophony; Cantica Ecclesiastica;* and with William Mason (whose daughter he married) some musical publications. He died 1887.

WEBB, James Watson, b. Claverack, N. Y., 1802; entered the U. S. army in 1819 as 2d lieut. of artillery, was stationed in the west, and in 1827 resigned his commission. In 1829 he founded the *Morning Courier and New York Enquirer*, by uniting the *Enquirer* with the *Courier*, which he had then owned for two years; and was its editor and proprietor for about thirty years. He was appointed, 1843, engineer-in-chief of the state of N. Y., with rank of maj.-gen.; appointed, 1861, minister and envoy-extraordinary to Brazil, where he remained until 1869, with the exception of an absence in Europe, in which he negotiated the secret treaty with the French emperor for the removal of French troops from Mexico. After his return from Brazil, W. resided in New York till his death, 1884. He pub. *Altowan, or Adventures in the Rocky Mountains* (1846); *Slavery and its Tendencies* (1856).

WEBB, Captain Matthew, 1840–83; b. Shropshire, England. He went to sea at an early age and became capt. of a merchantman; first attracted notice by jumping from a Cunard steamer during a storm to save a man who had fallen overboard, for which he was awarded a gold medal by the Royal Humane soc. He accomplished the feat of swimming the English channel from Dover to Calais, a distance of 25 m., 1875. He was drowned while attempting to swim the Niagara whirlpool rapids, 1883.

WEBB, Samuel Blatchley, 1753–1807; b. Wethersfield, Conn.; educated under the supervision of his step-father, Silas Deane, he was early taught, and deeply imbibed, the political principles of American independence. Excited by the news from Lexington, young Webb left Wethersfield, a lieutenant in Captain Chester's company, for Bunker Hill. For his discretion and valor in that battle he was made a lieut.-col., and private secretary to Gen. Washington. He wrote the order announcing in New York July 9, 1776, the declaration of independence, and refused to receive a letter from lord Howe, directed to George Washington, Esq. He fought bravely on Bunker Hill and Long Island, at White Plains, Trenton, and Brandywine. In 1777 Col. Webb raised and equipped the 3d Connecticut regiment, but in that year was taken prisoner and not exchanged till 1780. He then received, as brevet brig-gen., the command before held by Baron Steuben. At his home in Wethersfield, in May, 1781 (the house is still standing), he entertained General Washington and Count Rochambeau in their important conference. In 1783 he was one of the sixteen officers who formed the society of the Cincinnati.

WEBB CITY, a city in Jasper co., Mo.; on the Kansas City, Fort Scott, and Memphis, the Missouri Pacific, and the St. Louis and San Francisco railroads; 6 miles n. of Joplin. It is noted for its extensive lead and zinc mining interests, and has a national bank, high school, electric light and street railroad plants, and several daily and weekly newspapers. Pop. '90, 5043.

WEBER, a co. in n. Utah, having the Great Salt lake for its w. boundary; drained by Weber river; containing a part of the Wasatch range of mountains; 650 sq. m.; pop. '90, 22,723. Co. seat, Ogden.

WEBER, Albrecht Friedrich, b. Breslau, 1825; studied in Breslau, Bonn, and in Berlin with Bopp, became an eminent Sanskrit scholar, visited England and France in 1846. In 1856 he was appointed extraordinary professor of ancient Indian languages and literature at Berlin; in 1867 full professor. He published *Indische Studien* (17 vols., 1849–85), containing information in relation to the metrical system of Indian antiquity. He has translated Indian dramas, and edited the *White Yajur-Veda* (3 vols., 1849–59). He was an active collaborator on the great Petersburg Lexicon. Among his later writings are *Die Griechen in Indien* (1890), and *Vedische Beiträge* (1894–5).

WEBER, Karl Maria von, a musical composer of high eminence, was b. at Eutin in Holstein, Dec. 18, 1786. Musical and dramatic talent had been hereditary in his family for some generations; his father, by turns officer in the army of the palatinate, finance minister of the elector of Cologne, music-director to the prince bishop of Eutin, and head of a company of strolling players, led a somewhat irregular and checkered life. Young Weber showed early a genius for music, but his instructors were often changed, in consequence of his father's change of residence. The teachers to whom he owed most were Hauschkel at Hildburghausen, Michael Haydn at Salzburg, and Valesi and Kalcher at Munich. His father's impatience and want of judgment were injurious to him in many ways, particulary in the efforts made to bring him before the public prematurely as a musical prodigy. At the age of 13 he composed an opera called *Die Macht der Liebe und des Weins*. When but 14 his second opera, *Das Waldmädchen*, was

brought out, without much success at first; but was afterward far better received than he himself thought it deserved. The next effort of the young opera composer was *Peter Schmoll und seine Nachbarn*, composed at Salzburg in 1801, and performed at Vienna with but indifferent success. At Vienna he became acquinted in 1803 with Joseph Haydn and the abbé Vogler, and studied for some time under the latter. In 1804 he left Vienna, to be conductor of the opera at Breslau, and while resident there composed the greater part of his opera of *Rübezahl*. We next find him, in 1806, with prince Eugene of Würtemberg at his court of Carlsruhe in Silesia, where he composed two symphonies and three concertos. In 1807 he went to Stuttgart, as private secretary to duke Ludwig, becoming also musical instructor to his children; and while there he composed the opera of *Silvana*, and a cantata called *Der erste Ton*, besides overtures, choral pieces, and piano-forte works. Getting into disfavor and pecuniary embarrassments, the result of his father's recklessness, he was dismissed the court of Würtemberg, and took up his residence successively in Mannheim, Heidelberg, and Darmstadt, at which last place he composed his operetta of *Abu Hassan*. He then made a musical tour through Germany, during which his concerts were everywhere well attended. From 1813 to 1816 he was director of the opera at Prague, which he entirely remodeled; and during his residence in the Bohemian capital composed *Kampf und Sieg*, and numerous other songs, including that noble national series from Körner's *Leier und Schwert*, which had no little influence in rousing patriotic sentiment during the war of liberation.

In 1817 he was invited to form a German opera at Dresden; and there during the remainder of his life, he held the post of *kapellmeister* to the king of Saxony. To this period belong his most important compositions, including *Preciosa*, *Der Freischütz*, *Euryanthe*, and *Oberon*. None of these works, however, was first brought out in Dresden. The music to Wolff's *Preciosa*, the subject of which is taken from a novel by Cervantes, was first produced on the Berlin stage, where it made a powerful impression. The author's *chef-d'œuvre*, the opera of *Freischütz*, the libretto or which was written by the composer's friend, Friedrich Kind, also first saw the light in the Prussian capital in 1822. It was a great success; its novelty and beauty, as well as the deep thought contained in it, excited an extraordinary sensation throughout Germany, which soon extended to France and England. *Euryanthe*, produced in Vienna in 1823, was not quite so warmly received. Bearing more the impress of labor and cultivation, and less that of the composer's natural vein of romance, it has never been in such general favor as its predecessor. *Oberon* was written in prospect of a visit to London to a libretto supplied by Mr. Planché. When Weber set out for England, he was already struggling against mortal disease. On Mar. 8, 1826, he appeared at Covent Garden theater as conductor of a selection from *Freischütz;* and on April 12 following he also conducted, on the first appearance of *Oberon*, with applause on both occasions incessant and uproarious. At his benefit concert on May 26, he was hardly able to go through the duty of conductor; and on June 5 he was found dead in bed in the house of sir George Smart, whose guest he was. He was interred in the Roman Catholic church, Moorfields; but in 1844 his body was removed to Dresden; and a statue of him by Reichel was erected in 1860 in front of the Dresden theater. Weber was married in 1818 to Carolina Brandt, an operatic singer of some note, daughter of Brandt the violinist, by whom he left a family.

The verdict of posterity, as well as of his contemporaries, has placed Weber in the first rank of musical composers. He was the first to use those bold effects of harmony and modulation whose introduction forms an era in the history of music. In his operas, the spirit of the romantic school appears in its brightest and most captivating form; and the overtures are masterpieces of imagination, each presenting an outline of the work to which it belongs. Besides the above operas and songs, his musical works are numerous, comprising concertos for the piano-forte, clarionet, oboe, bassoon, and violoncello—symphonies and overtures, one of the most beautiful and characteristic of them being the overture to the *Beherrscher der Geister*. Among his posthumous writings is an autobiography. His life has been written by his son, Baron Max Maria von Weber, (trans. by Simson). See also Jähn's *W.* (1873), and *W.* by Benedict, (1880).

WEBER, Wilhelm Eduard, b. 1804, Germany; educated at Halle. In 1825, in association with his brother, he published *Die Wellenlehre*. He became assistant professor of natural philosophy at Halle in 1827, and professor of physics at Göttingen in 1831. He was removed from his position at Göttingen in 1837 for having protested against the violation of the constitution. He held the chair of physics at Leipsic, 1843–49, when he was restored to his former position at Göttingen. His researches on terrestrial magnetism in connection with Gauss are well known. He died 1891.

WEBSTER, a co. in s.w. Georgia, drained by Kinchafoona creek; 225 sq.m.; pop. '90, 5695. Co. seat, Preston.

WEBSTER, a co. in central Iowa, drained by the Des Moines and Lizard rivers; 720 sq.m.; pop. '90, 21,582, chiefly of American birth, with colored. Co. seat, Fort Dodge.

WEBSTER, a co. in w. Kentucky, having the Green river for its n.e. boundary; 340 sq.m.; pop. '90, 17,196. Co. seat, Dixon.

WEBSTER, a parish in n.w. Louisiana, drained by bayou Dorcheat; containing lake Bistineau in the s. portion; formed out of parts of Bossier and Claiborne counties; 609 sq.m.; pop. '90, 12,466. Parish seat, Minden.

WEBSTER, a co. in north central Mississippi, organized as Sumner in 1874; 430 square miles; pop. '90, 12,060. It is drained by Big Black river. The surface is rolling and well wooded, the soil producing corn, cotton, and potatoes. Co. seat, Walthall.

WEBSTER, a co. in s.w. Missouri; drained by the Niaugua river, the James river, and Finley creek; 630 sq. m.; pop. '90, 15,177. Co. seat, Marshfield.

WEBSTER, a co. in s. Nebraska, drained by the Republican river; 576 sq. m.; pop. '90, 11,210. Co. seat, Red Cloud.

WEBSTER, a co. in central West Virginia; 415 sq. m.; pop. '90, 4783. Co. seat, Addison.

WEBSTER, a town in Worcester co., Mass.; on the Boston and Albany and the New England railroads; 16 miles s. of Worcester. It was incorporated in 1832; contains several villages, a high school, public library, national and savings banks, electric light plant, and about 10 churches; and is principally engaged in the manufacture of cotton and woolen goods, and shoes. Pop. '90, 7031.

WEBSTER CITY, city, co-extensive with Boone township, and co. seat of Hamilton co., Ia.; on the Boone river and the Chicago and Northwestern, the Crooked Creek, and the Illinois Central railroads; 80 miles n. of Des Moines. It has national banks, high school, valuable mineral springs, coal mines, iron furnaces, and several daily and weekly newspapers. Pop. '90, 2829.

WEBSTER, DANIEL, an American statesman and jurist was born in Salisbury (now Franklin), New Hampshire, Jan. 18, 1782, and was the second son of Ebenezer Webster (q.v.), a farmer and the justice of the county court and Abigail Eastman. Salisbury was at that time a frontier settlement, and schools were poor, but the boy was instructed by his mother, and after a few months' study at Exeter Academy in 1797, and under Rev. Samuel Wood, of Boscawen, he entered Dartmouth College, where he partly supported himself, and soon became first in his class, distinguishing himself in classics and English literature. He graduated in 1801, and entered the law-office of Thomas W. Thompson, of Salisbury, afterwards U. S. senator. From January to September, 1802, he was principal of the Fryeburg academy, Maine, then continued his studies till 1804, when he removed to Boston, to complete them under Christopher Gore, afterwards governor, and in 1805 was admitted to the Suffolk County bar. He commenced practice at Boscawen, but in 1806 was admitted to the superior court of New Hampshire and settled in Portsmouth, where he quickly distinguished himself.

The war of 1812 called into public life the strongest men of both political parties, and Webster, having adopted and advocated the principles of the party opposed to the war, was elected to represent the people of New Hampshire in congress. His reputation for thorough acquaintance with public affairs, domestic and foreign, preceded him and secured him influential positions on the most important committees. His speeches for the repeal of the embargo, and the increase of the navy, and on the great financial questions which then agitated and divided the nation, evidenced a comprehensive and deep insight into the principles involved, and the immediate necessities of the nation, as well as a firm adherence to the measures of the party he represented. They were imbued with such a spirit of lofty patriotism, and uttered with such manifest sincerity, that they secured for him, in congress and through the country, universal respect.

He was re-elected in 1814, and during the succeeding sessions supported the charter of the bank of the United States, and introduced a resolution requiring payments to the treasury to be made in specie or its equivalents. In 1816 he made Boston his permanent home, where he practised steadily for nearly seven years, and became known as one of the foremost jurists and advocates of the country, by his argument in the contest between Dartmouth College and the state legislature (1818), the validity of Stephen Girard's will, and the trial of the Knapps at Salem for the murder of Knapp. In 1820 he was chosen a member of the committee to revise the constitution of the state ; in 1822 was elected to Congress from Boston. Orations at Plymouth, Mass., on the Pilgrims, in 1822, on the laying of the corner-stone of Bunker Hill monument, in 1825, and on its completion in 1843, and his eulogy on Adams and Jefferson in 1826, gave him a more than national fame for eloquence. While in congress, he increased his reputation as a statesman by a speech on the Greek revolution, and by opposing the increase of protective duties. As chairman of the judiciary committee he reported and carried through the house a complete revision of the criminal law of the United States. Re-elected in 1824, he supported John Quincy Adams as a candidate for the presidency, and advocated a convocation of the Congress of Panama for the consolidation of the Spanish American republics. In 1826 he was re-elected to Congress, but in 1827 was transferred to the senate succeeding Elijah J. Mills, and retained his seat by re-election till 1841. During this term of office he favored the protective tariff of 1828, and in 1830 delivered his now famous speeches in reply to those of Robert Y. Hayne, of South Carolina, affirming the doctrine of nullification, and attacking New England.

In 1832 he favored the renewal of the charter of the United States bank, and supported Henry Clay as a presidential candidate, and while opposed to President Jackson's financial policy, defended the latter's "force bill" directed against the South Carolina "nullifiers ;" and in 1833 opposed Calhoun's defense of nullification, arguing that the union of states was a government and not a league. In that same year he spoke and

voted against Clay's Compromise tariff, and secured the passage of resolutions condemning President Jackson's removal of the deposits from the bank of the United States. Mr. Webster became the leader of the Whig party, organized in 1834, and his political aspirations were increased by a tour through the west in the summer of 1833, where he aroused much enthusiasm, and by his nomination for the presidency in 1836 by the legislature of Massachusetts. During the financial crisis of 1837, he made one of his most elaborate speeches, in opposition to the "sub-treasury" system of the administration. In 1839 he visited England, Scotland, and France, and was received with much respect and admiration in court-circles. In 1840 Webster was nominated for the presidency by the Massachusetts Whigs, but was not generally acceptable, and withdrawing his name, he took an active part in securing the election of Harrison, who appointed him secretary of state in 1841. This office he retained under President Tyler, until 1843, and displayed great ability and tact in the negotiation of the Ashburton treaty of 1842. Declining a re-election to the senate, Mr. Webster resumed his law practice in Boston, spending his summers at Marshfield, where he had bought an estate in 1833. In 1844 he was again nominated for the presidency, but the choice of his party was given to Clay, whom Webster nevertheless supported. In 1845 he re-entered the senate as Choate's successor, where he opposed the annexation of Texas and the prosecution of the war with Mexico. The disappointment at not receiving the Whig nomination for the presidency in 1848 bore heavily upon Mr. Webster, but he gave a cordial support to President Taylor's administration. He now devoted his senatorial efforts to the preservation of the union by the advocacy of compromises on the slavery question, and on Mar. 7, 1850, condemned the refusal of certain states to comply with fugitive slave law. This inconsistency on the part of one whose attitude towards slavery and compromise with slave states had been continuously hostile, excited great indignation and sorrow in the north, and hastened the decline of Webster's popularity. In 1850 he became again secretary of state under Fillmore, and managed with great skill various international disputes with Austria, Spain, and Great Britain. In 1851, July 4, he delivered an address on the completion of the laying of the corner-stone of the extension of the capitol, and in 1852 argued the celebrated Goodyear India-rubber patent case at Trenton. He was a Whig candidate for the presidential nomination in 1852, but was defeated by General Scott, and signified his disappointment by advising his supporters to vote for Pierce. In May, 1852 he was thrown from his carriage, at Marshfield, and though he returned to his duties at Washington, his health declined, and resigning his office he returned to Marshfield, where he died, Oct. 24.

Mr. Webster had a commanding figure, a large head, and deep-seated lustrous eyes, a swarthy complexion, and a powerful and beautiful voice. He was indolent by nature, yet was athletic and fond of outdoor life and sports. His manners were impressive but cold, in spite of a strong sense of humor that enlivened his conversation. He was an affectionate father, husband, and friend; but was extravagant in his way of living, and was drawn by his passions into excesses. Although not actively connected with any religious body after attaining his majority, he was a firm believer in Christianity, and directed that a statement to that effect should be carved upon his tombstone. He was twice married: in 1808 to Grace Fletcher, of Hopkinton, N. H. (d. 1828); and in 1829 to Caroline Bayard Le Roy, of New York City (d. 1882). His second son, Edward, a major of volunteers, died in the city of Mexico during the Mexican war, and he lost a daughter that same year. One son, Fletcher, survived, who was secretary of legation to China in 1843; was surveyor of the port at Boston, 1850–61, and who, serving in the union army as colonel, was killed at the battle of Bull Run.

See *The Speeches, Forensic Arguments, and Diplomatic Papers of Daniel Webster* (12th ed., 1864); *Private Correspondence of Daniel Webster* (5th ed., 1864); Harvey's *Reminiscences and Anecdotes of Daniel Webster* (1877); the Life by George Ticknor Curtis (1869), and by Lodge (1884).

WEBSTER, Ebenezer, 1739–1806; b. N. H. · a soldier under Amherst in the French war. Settling in Salisbury, now Franklin, N. H., he kept a tavern, and had a farm until the outbreak of the revolutionary war, when he led a company of militia to join the continental army at Cambridge. He served through the war, at whose close he was a col. of militia. He served in both houses of the New Hampshire legislature, and from 1791 till his death was judge of the Hillsborough co. court of common pleas.

WEBSTER, Horace, 1794–1871; b. Vt.; graduated at West Point, 1818, and was commissioned in the infantry. He was assistant professor of mathematics at the military academy for seven years; in 1825 resigned his commission and became professor of mathematics and philosophy in Geneva (now Hobart) college. In 1848 he was made president of the New York free academy, now known as the college of the city of New York. From 1852 to 1869 he acted as professor of moral, political, and intellectual philosophy, as well as president, and in the last named year became professor *emeritus*.

WEBSTER, John, b. England, late in the 16th c.; the associate in play-writing of Rowley, Marston, Dekker, Drayton, and others. His best dramas are *The White Devil* (1612); and *The Duchess of Malfy* (1623).

WEBSTER, Noah, American author and philologist, was born in Hartford, Conn., Oct. 16, 1758. His father, whose farm lay in the western part of the town, now con-

stituting West Hartford, was descended from John Webster, one of the original settlers of Hartford, and his mother was descended from Governor Bradford of Plymouth Colony. He fitted for college under Rev. Nathan Perkins, D.D., and entered Yale in 1774; served under his father, a captain of militia, during the excitement caused by Burgoyne's expedition in 1777; then returned to college to graduate in 1778. During the period 1779–81, he taught school in Hartford and studied law, but receiving no encouragement to practice, opened, in 1782, a classical school at Goshen, N. Y., where he began the preparation of school books, and in 1783 returned to Hartford and published in parts, 1783–85, a spelling-book, grammar, and reader under the title of *A Grammatical Institute of the English Language.* The first part was the basis of the famous spelling-books subsequently published, and of which more than 80,000,000 copies had been sold up to 1880. He also published Governor Winthrop's *Journal;* contributed in 1783 to the *Connecticut Courant* a series of papers signed Honorius in defense of the soldiers' pay-bill; published in 1785 *Sketches of American Policy,* advocating the formation of a new constitution, and in 1786 traveled in the south to procure the enactment of state copyright laws, the confederation not having the requisite powers. He also lectured in a number of eastern cities on the English language. In 1787 he became superintendent of an Episcopal academy in Philadelphia, and when the Constitutional Convention ended published a pamphlet entitled *Examination of the Leading Principles of the Federal Constitution.* In Dec., 1787, he established in New York *The American Magazine,* but losing heavily, discontinued it after a year's trial and returned to Hartford in 1789. After some years of successful practice as a lawyer he returned to New York in 1793, where he started a daily newspaper, *The Minerva,* and a semi-weekly edition of *The Herald* for the support of the national administration. These names were afterwards changed to *Commercial Advertiser* and *New York Spectator.* In 1795 he wrote for his paper a series of able articles under the signature of Curtius in defense of Jay's treaty with England, concluded the previous year. In 1798 he removed to New Haven, and published in 1799 *A Brief History of Epidemics and Pestilential Diseases* (2 vols., Hartford); in 1802, *Historical Notices of the Origin and State of Banking Institutions and Insurance Offices* and *Rights of Neutral Nations in Time of War;* in 1806, *A Compendious Dictionary;* in 1807, *A Philosophical and Practical Grammar of the English Language,* and began the preparation of his *American Dictionary of the English Language.* After devoting ten years to the study of the English language he began his dictionary anew, spent two months in Paris in 1824 and eight at Cambridge, England, continuing his philological studies; and returned to America in 1825 to complete his work. In 1828 an edition of 2500 copies was published, and was followed by one of 3000 copies in England.

During the years 1812–22 Mr. Webster resided at Amherst, Mass., where he aided in founding Amherst College. He was for several years president of its board of trustees, and also represented Amherst in the state legislature. He had previously represented New Haven in the Connecticut legislature and had been a judge of one of the state courts. He returned to New Haven in 1822 and received from Yale College in 1823 the degree of LL.D. In 1840–41 a second edition was published, and in 1843 Mr. Webster revised the appendix. He died in New Haven, May 28, 1843. In 1848, a third edition of the dictionary appeared and in 1859 a fourth (pictorial), both edited by his son-in-law, Prof. Chauncey A. Goodrich; in 1864 a fifth edition, edited by Prof. Goodrich and Prof. Noah Porter, was published, and a sixth edition appeared in 1880. The word "American" on the title-page gave place to "International" in the edition of 1891.

Mr. Webster published *Dissertations on the English Language* (1789); *The Revolution in France* (1794); *Letters to Dr. Priestly* (1800); *Origin, History, and Connection of the Languages of Western Asia and of Europe; Letters to a Young Gentleman Commencing His Education* (1823); *Manual of Useful Studies* (1832); *History of the United States* (rev. ed., 1838); *A Collection of Papers on Political, Literary, and Moral Subjects* (1843); also revised editions of the Bible (1833) and of the New Testament (1839). His *Synopsis of Words in Twenty Languages* (about 1817) has never been published. See the memoir by Goodrich prefixed to the later editions of the dictionary, and the Life, by Scudder (1882).

WEDDAHS, or VEDDAHS, descendants of the original inhabitants of Ceylon, who were conquered and nearly exterminated by the Singhalese, 543 B.C., under Wejaga, the first Singhalese king. They inhabit chiefly the great forests of the interior, and also the most inaccessible parts of the central table-land.

WEDDERBURN, JAMES, 1500–64; b. Scotland; edited with his brother Robert a work entitled *Ane Compendious Buike of Godly and Spirituall Sangs, collectit out of Sundrie Partes of the Scripture, wyth sundrie of uther Ballates changed out of Prophane Sangs for avoyding of Sinne and Harlotrie.* This was the principal psalm-book used in Scotland. It was re-published by sir. J. G. Dalyell in his *Scottish Poems of the Sixteenth Century.* To Wedderburn is attributed also *The Complaynt of Scotland,* said to be the only classic work in old Scottish prose.

WEDDING ANNIVERSARIES, GIFTS IN COMMEMORATION OF. The names given to the several anniversaries of a marriage are said to be of quite ancient origin, and arose from the gift which was regarded as the most suitable offering from the husband to the

wife. In modern times, however, these anniversaries are made the occasion of many pleasant gatherings of friends, in which all who so desire, may present to the married couple the gifts supposed to be suitable to the day.

First anniversary, Paper.
Second anniversary, Straw.
Third anniversary, Candy.
Fourth anniversary, Leather.
Fifth anniversary, Wooden.
Seventh anniversary, Floral,
Tenth anniversary, Tin.
Twelfth anniversary, Linen,
Fifteenth anniversary Crystal.
Twentieth anniversary, China.
Twenty-fifth anniversary, Silver.
Thirtieth anniversary, Pearl.
Thirty-fifth anniversary, Coral.
Fortieth anniversary, Emerald.
Forty-fifth anniversary, Ruby.
Fiftieth anniversary, Gold.
Seventy-fifth anniversary, Diamond.

The Diamond Wedding is usually celebrated at sixty years of married life, instead of waiting until the seventy-five years have expired. The others that are most frequently celebrated are the Paper, Wooden, Tin, Crystal, Silver and Gold.

WEDGE, one of the mechanical powers, and in principle a modification of the inclined plane. The power is applied by pressure, or more generally by percussion to the back, thus forcing the edge forward. The wedge is employed for such purposes as the splitting of wood, the fastening firmly of the handle of an axe, the raising of a ship in a dry dock, etc. The investigation on statical principles of the mechanical advantage of the wedge is extremely unsatisfactory, the power, which is scarcely ever a "pressure," being always assumed to be one, and the enormous friction on the sides of the wedge being generally neglected; the theoretical result thus arrived at is that the pressure applied at the back: the resistance or weight: $\frac{1}{2}$ width of back of wedge: length of side. In the application of the wedge to the splitting of wood in the direction of the fibres, the split generally extends some distance in advance of the edge of the wedge, and the action of the latter is then a combination of the action of the wedge with that of the lever; in fact, this compound action is found more or less in all applications of the wedge as a cutting or splitting weapon, and tends further to complicate the statical investigation of its mechanical properties. The best and simplest illustrations of the single wedge are axes, nails, plugs, planes, chisels, needles, and all sharp-pointed instruments.

WEDGWOOD, Josiah, the creator of British pottery as an art, was b. at Burslem in Staffordshire, in the year 1730. His father was a potter, and very early he was set to work at the same business. His education seems to have been of the scantiest. After an abortive attempt to settle himself at Stoke with a partner named Harrison, he returned to his native place, and there commenced business as a potter. From the first, his ardor for the improvement of the manufacture was conspicuous. His first efforts were directed to the refining of the material, and soon he succeeded in producing a beautiful cream-colored porcelain, which became popularly known as queen's ware, queen Charlotte having much admired it, and extended her patronage to the manufacturer. Subsequently other improved materials were produced. The attention of Wedgwood was not less assiduously directed to consideration of form and decoration; he busied himself in emulating the grace of the antique models; and the celebrated sculptor, Flaxman, was employed to furnish designs to him. In this way what he found a rude and barbarous manufacture, he raised to the level of a fine art; and he found his reward in the speedy amassing of an immense fortune. In 1771, he removed his works some little way from Burslem; and to the new site he gave the fanciful name Etruria, as that of the country of old most celebrated for the beauty of its ceramic products. Here he built himself a splendid mansion; and here, in 1795, he died.

Apart from his eminence in the art to which he mainly devoted himself, Wedgwood was a man of considerable culture. Natural philosophy, in particular, he studied with much success. He was a fellow of the Royal Society, as also of the society of Antiquaries; and to the *Philosophical Transactions* he from time to time contributed papers. He likewise interested himself deeply in all matters of public concernment; and mainly through his influence it was that the Grand Trunk canal, uniting the waters of the Mersey, the Trent, and the Severn, was carried out.

Full particulars as regards this remarkable man may be found in two lives of him published in 1865, one by Eliza Meteyard, the other by Llewellyn Jewett. See also Eliza Meteyard's *Memorials of Wedgwood* (1875), and *Wedgwood Handbook* (1875).

WEDGWOOD WARE, a beautiful kind of pottery invented by Josiah Wedgwood in 1775. It consists of flint, Potter's clay, carbonate and sulphate of barytes, and zaffre, or some other coloring material. It is also called jasper ware. The beautiful classical designs on the earliest productions of this manufacture were many of them executed by Flaxman, and are very highly valued.

WEDNESDAY, the fourth day of the week, the *Dies Mercurii* of the Romans, the *Mittwoch* (mid-week) of the modern Germans. The name Wednesday is derived from the northern mythology, and signifies Woden's or Odin's day. The Anglo-Saxon form was *Wôdanes dag*, the old German *Wuotanes tac*. The Swedish and Danish is *Onsdag*.

WEED, *Lymphangeitis*, or a shot of grease, consists in inflammation of the large absorbent glands and vessels situated between the horse's thighs. Rarely, it attacks the corresponding structures between the fore-limbs. It occurs in round-limbed, indifferently bred, hard-wrought horses; appears particularly after a day or two of rest, after exposure to cold, or during imperfect action of the bowels; and is said to depend upon more blood being produced than is required to replace the natural waste of the body. It is identified by lameness, tenderness in the groin, and fever. The horse must be bled, have a full dose of aloes, and when the pain and tenderness are great, ten drops of Fleming's tincture of aconite in water every two hours; the limb should be bathed for at least six or eight hours continuously in hot water, and then rubbed dry and kept warm. The subsequent swelling will be reduced by saline draughts, diuretics, rubbing of the limb, and exercise.

WEED, Stephen H., 1834–63 ; graduated at West Point in 1854, and was appointed to the artillery. He took part in the Florida war and the Utah expedition. He was made capt. in the artillery in 1861, was attached to the army of the Potomac in 1862, and served through the peninsular campaign, showing great gallantry at Antietam and Chancellorsville. Soon after the latter battle he was made brig.gen. of volunteers. He was killed at Gettysburg at the head of a brigade of regulars in the 5th corps.

WEED, Thurlow, American journalist, was b. at Cairo, N. Y., Nov. 15, 1797, and at the age of 10 years was cabin-boy on a sloop on the Hudson river; at 12 he was an apprentice in the printing-office of Mr. Croswell, at Catskill; then lived for a short time in a backwoods settlement, but at 14 returned to printing. He was a volunteer in the war of 1812, and at the age of 21 established a newspaper in western New York, and during the anti-masonic excitement, was elected to the state legislature, 1826–27, where his peculiar and almost unrivaled abilities as a political manager or "wire-puller" were early recognized. In 1830 he settled at Albany, the state capital, and commenced the publication of the *Evening Journal*, an anti-Jackson, whig, or republican paper, which became the organ of the party, and of the state government when its party was in power. Declining all offices for himself, except the profitable one of state printer, he is supposed to have exercised almost supreme influence in nominations and appointments, and to have secured the choice of Presidents Harrison and Taylor ; was through his whole career, the friend and adviser of Mr. Seward. In 1861 he was sent in a semi-diplomatic capacity to Europe, and on his return was presented with the freedom of the city of New York, where he became part proprietor and one of the editors of the *New York Times*, and subsequently editor of the *Commercial Advertiser*. In 1866 he published *Letters from Europe and the West Indies*. After a serene old age, he d. 1882.

WEEDON, George, b. Fredericksburg, Va., about 1730; at the outbreak of the revolutionary war was commissioned lieut.-col. in the Virginia troops. At Brandywine he was at the head of one of Greene's divisions, and to him is ascribed the honor of stopping the British pursuit and saving the patriot army. He also served with credit at the battle of Yorktown and elsewhere. He died subsequent to 1790.

WEEDS, the name given to all those plants which grow wild in cultivated grounds, and injure the crops; which they do both by choking them, and by exhausting the soil. Those weeds which are annuals or biennials, as charlock, yellow rattle, and melilot, may gradually be got quit of by merely cultivating, for a succession of years, such plants as are to be cut before the seeds of the weeds are fully ripe. Perennial weeds, such as couch grass, can only be removed from the ground by repeated and careful tilling; and for this purpose, crops which require much hoeing are advantageously planted, and recourse is had to summer fallowing in fields, and frequent weeding in gardens. Thistles and other large weeds are frequently pulled in corn fields before the corn comes into ear, and to prevent their seeding, they are cut in pastures. Sedges and rushes, which spring up in great abundance in damp grounds, disappear on thorough draining. Leafy crops which thickly cover the soil, prevent the growth of many weeds by the exclusion of air and light. Weeds which have been rooted up form excellent compost for manure. Those which make their appearance in fallow grounds serve for green manuring when they are plowed down.

WEEK (Goth. *Vico;* Old High-German, *Wehha* = order, cycle (?); Lat. *Vicis;* Gr. *Hebdomas, Sabbaton;* Heb. *Shabua*, from *Sheba*, seven) designates generally a period of seven days. It was probably first instituted as a kind of broad subdivision of the periodical month, corresponding to the four quarters of the moon, or about 7⅜ days. Although found as a civil institution among some nations at the earliest time—e.g., with the Hindus, Assyrians, Persians, etc., it is only with the Jews that we see a religious signification given to the concluding or seventh day of that period itself. Both their cosmogony and legislation are connected with it. The Sabbath (q.v.) is emphatically the day of rest, while seven weeks after the Passover, the Pentecost or feast of weeks takes place, etc. (see Seven). It is doubtful whether it was through the Jews that this com-

putation of weeks was introduced to the Egyptians, but it is certain that the latter at an early period counted seven periodical days, naming them according to the seven planets then assumed. The application of the names of the planets to the days of the week in the order they now stand, originated in this way: It was an astrological notion that each planet in order presided over an hour of the day, the order, according to their distances from the earth, being, on the geocentric system, Saturn, Jupiter, Mars, the sun, Venus, Mercury, the moon. Assuming Saturn to preside over the first hour of Saturday, and assigning to each succeeding hour a planet in order, the 22d hour will fall again to Saturn, the 23d to Jupiter, the 24th to Mars, and the first hour of the next day to the sun; in the same way, the first hour of the following day falls to the moon, and so on. From Alexandria this seven-days' week was imported, together with the names of the individual days, to the Greeks—who previously divided their months into three decades—and to the Romans, about the time of Christ. Rome had previously counted her periods by eight days, the eighth day itself being originally called *Nundinæ*—a term later applied to the whole cycle—as returning *nono quoque die*, when the country people were in the habit of coming to town for the purposes of business, and chiefly to inquire after public news, the changes in government and legislation, vacant places, and the rest. But the seven days' cycle soon found great favor among the Romans, owing partly, perhaps, to the spread of Egyptian astrology, although the change was not officially introduced before Constantine. It is certain that the Jewish name Sabbath came into use in Rome, and from Rome it spread to all the Romanic languages, even into the German. It survives in the Italian *Sabbato*, the Spanish *Sabado*, the French *Samedi* (*Sabbati dies*), and the German *Sambaztac*, which afterward became *Samstag*. In the same manner, the Latin *septimana* (the Greek *hebdomas*) had become the modern designation for week in the Italian *settimana*, Span. *semana*, French *semaine*, and even in the Irish *sechtmaine*. The *Codex Theodosianus* is the first document which adopts the term *septimana* in the meaning of weeks. The Jews, as well as the early Christians, had no special names for the single days, but counted their number from the previous Sabbath, beginning with Sunday, as the first after the Sabbath, and ending with Friday, as the sixth after the previous, or eve (*Ereb*) of the next Sabbath. After a very short time, however, young Christianity, which in the same manner had endeavored to count from the *feria secunda*, or second day after Sunday, to the *Septima* (or Saturday), had to fall back again upon the old heathen names, previously introduced in Gaul, Germany, etc., by the heathen Romans. The Sunday, or *dies Solis*, alone was changed in many of the Romanic languages in accordance with the new creed. It was called *Kyriake*, *dies Dominicus*, or *Dominica*, the day of the Lord, a term which in Italian became *Domenica*, in Spanish *Domingo*, and *Dimanche* in French. The Germanic *Frôntac* (from *frôn* = *dominicus*) occurs but once. It is very curious to notice how the names of the five days of the week which followed those named after the sun and moon, became Germanized, as it were, or the names of the originally imported gods translated into those of the Germanic divinities. Thus, the day of Mars became that of Ziu (see Tyr). Mercury became Wodan; and the fourth day was called after the latter, in Dutch, English, and Scandinavian; while in Germany it was simply called the middle of the week = *Mittwoch*. The day of Jupiter became the day of Thor = Thursday, *Donnerstag;* while the *Dies Veneris* was transformed into the day of Freya, the wife of Odin (Wodan). The day of Saturnus, retained under this name in some northern tongues, became a *langardage*, or bathing-day, in others; while in upper Germany it remained a Sunday-eve (*feria ante dominicam*) or *Samstag* (see above). From recent discoveries of Assyriologists, it seems certain that the Assyrians, and through them probably the other Semitic nations, derived their week of seven days from the Accadians or early Turanian inhabitants of Babylonia, who also observed the seventh day as a day of rest. To this remarkable people are also to be traced the planetary names which we still give to the days of the week. The Arabs, like the Jews, count their days (beginning and ending with sunset) by sevens, without giving them planetary names. Greeks, Slaves, and Finns also count their days from Sunday, instead of naming them. The French revolution altered the seven-days' week into a decade of 10 days; but the new computation introduced in 1793 was abrogated again in 1805. The "weeks of years" in Hebrew prophetical poetry (like the Roman *annorum hebdomadæ*) indicates cycles of seven years.—See Ideler's *Chronologie* (1831); Grimm's *Deutsche Mythologie* (1835); and Lenormant's *La Magie chez les Chaldéens* (1874).

WEEKES, Henry, 1807–77; b. England; studied sculpture at the Royal academy. He was long an assistant of Chantrey. Among his works are statues of Charles II., Bacon, Latimer, Ridley, Cranmer, and others. He became a member of the academy in 1863, and was professor of sculpture there from 1873.

WEEKS, Feast of (Gr. *Pentecoste* = fiftieth, Heb. *Shabuoth*, also called feast of harvest, day of the first-fruits, etc.), the second of the three great *regalim* or pilgrim feasts of the Old Testament, was celebrated seven weeks, or forty-nine days, after the passover. As the latter was the feast of the barley harvest, so the former was that of the wheat-harvest. The first two loaves of the new crop were offered up on the day of the festival—leavened, and containing about 3½ quarts each (the Mishnah speaks of their being 7 in. by 3), together with a peace-offering of two lambs. Besides this, a great burnt and sin offering—the former consisting of seven lambs, a bullock, two rams, to-

gether with the appropriate meat and drink offerings; the latter of one kid—were added, according to Leviticus (xxiii. 18); while Numbers (xxviii. 27) increases the number of the bullocks to two, and only mentions one ram—a number more in accordance with the regulations for the other festive sacrifices. The Jewish tradition, however, considers the animals mentioned in the later passage as an additional sacrifice; and Josephus has indeed added both up, except in as far as the rams are concerned, of which he only gives two. Tradition has given to this feast, which originally was only intended to represent the solemn closing of the harvest, a new significance by making it the anniversary of the Sinaitic legislation, which indeed must have taken place in the first days of the third month. But the pentecost, which is always fixed in the Jewish calendar on the 6th of Sivan, could not, before the establishment of astronomical computation, fall always on the same day, but must needs have fallen between the 5th and 7th of that month. Moses himself nowhere fixes the date of this festival as he does with the others. The Karaites, instead of referring the "morning of [after] the Sabbath" of Lev. (xxiii. 15) to the 16th of Nisan, take it literally, and celebrate the festival always on a Sabbath. The uncertainty of the lunar calculation and observation among the Jews of the dispersion, caused them also to add one day to this festival—a usage still retained at present. There seems to have been more of the character of a harvest-home inherent in this festival than in the passover, which partook particularly of the character of a large and solemn family-gatheriug. For the Christian adoption of this festival, see PENTECOST.

WEEKS, ROBERT KELLEY, 1840–76; b. New York; graduated at Yale coll., 1862, and at the law school of Columbia coll., 1864, but mainly devoted himself to literature, and published *Poems* (1866), *Episodes and Lyric Pieces* (1870), *Twenty Poems* (1876)—works full of high promise. A collection of his poems in one vol. was published posthumously, 1880.

WEENIX, JAN BAPTIST, the elder, 1621–60; b. Amsterdam; studied at Utrecht, and with Nicholas Mojert, whose style of painting he followed. He also lived four years at Rome. Though but 39 years of age at his death, he produced pictures in every department of painting, historical, portrait, animal, landscape, and marine. His son JAN, the younger, 1640–1719, was also a painter of merit, and excelled in hunting and sporting pieces.

WEEPING TREES are trees with remarkably elongated and pendulous branchlets, generally mere varieties of species which ordinarily have a different habit, as the weeping birch, weeping ash, and weeping willow, which are varieties of the common birch, common ash, and white or Huntingdon willow. The weeping birch occurs in a wild state in some places in the Highlands of Scotland, and is a characteristic ornament of the landscape. Trees intermediate in their habit between the weeping birch and the common variety are of very frequent occurrence. Weeping trees are much esteemed for ornamental purposes, and are not only very beautiful in themselves, but as a contrast to other trees in lawns and pleasure-grounds. They are therefore carefully propagated in nurseries. The weeping ash is often grafted on the common ash, but the result is seldom very satisfactory, the art of the gardener forcing itself too much upon attention. A tendency to the weeping habit of elongated and pendulous branchlets is manifested in some kinds of trees, as the tendency to vary into a very opposite habit, with the branchlets drawn up close together (var. *stricta* of botanists), appears in others, of which the Swedish juniper and the Irish yew are familiar examples.

WEERT, an unwalled t. in the Netherlands, province of Limburg, 15 m. w.n.w. of Roermond, on the ship-canal from Maastricht to 's Hertogenbosch. Pop. abt. 8000. There are several good schools, a collegiate institution, town-house, churches, and market-places. In the church of St. Martin is the grave of the count of Hoorn, who was beheaded at Brussels, in 1568, for adhering to the prince of Orange in the struggle for religious and political freedom. A beautiful promenade leads to another church, outside the town, n. of which are the ruins of the old castle.

WEEVER, or STING-FISH, *Trachinus*, a genus of acanthopterous fishes of the family *uranoscopidæ*, also called *trachinidæ*. In this family the ventrals are composed of a spine and five jointed rays, and are generally situated before the pectorals. The scales are cycloid, or wanting. The eyeballs are capable of being raised in a remarkable manner out of their sockets, and of being retracted again to the level of the orbits. The species frequent the bottom of the sea. They are often furnished with barbels, and have also a peculiar membranous filament under the tongue, which they can protrude at pleasure. In the genus *trachinus* the head is compressed, the eyes are placed high and close together; there is a long sharp spine on the hinder part of the gill-cover. There are two dorsal fins; the second dorsal and the anal are long; the ventrals are close to the throat. Two species are found on the British coasts, the GREATER WEEVER or STING-BULL (*T. draco*), and the LITTLE WEEVER or VIPER WEEVER (*T. vipera*). The former attains a length of nearly one foot; the latter seldom of more than four or five inches. The general form is long, narrow, and compressed; the little weever is proportionally deeper in body than the greater weever. The head of both is short, compressed, flat between the eyes, and rough on the summit; both dorsals and the anal fins are spiny; and in both the gill-cover is furnished with a strong and sharp spine, which is directed backward, and can be appressed to the body, but which is also capable of being made to stand out

so as to present its point to an adversary. Both species are of a yellowish brown color. They inhabit parts of the sea having a sandy bottom, and often partially bury themselves in the sand, but are ready to move off with great celerity if disturbed. They can live long out of the water; and if left by the retiring tide suffer no inconvenience. If assailed they can, by a sudden bending of the body, make use of one of the strong spines of the gill-covers against the assailant; and the wound thus inflicted is so severe as to lead to the opinion that the spine is coated with a venomous exudation. Naturalists, however, generally supposed the popular opinion to be erroneous, and the severity of the wound to be merely owing to the laceration effected by the spine, until it was discovered by Dr. Günther, in 1864, that poison-glands existed in connection with spines of some South American fishes of the family *siluridæ*. A peculiar stinging sensation attends a wound by a spine of a weever, which extends far up the arm, if the wound has merely been in a finger, and is much more severe than the pain of a wasp-sting. There is also a groove in the spine, which has perhaps something to do with the conveyance of the poison; but no poison-gland has yet been proved to exist. In France the fishermen are required, under a penalty, to cut off the spines of weevers before selling them. Weevers are esteemed for the table.

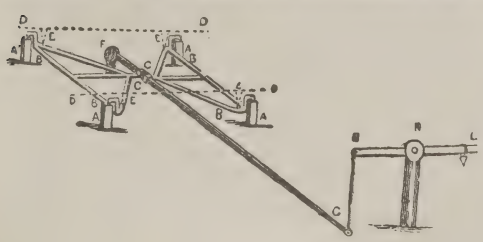
WEEVIL, *Curculio*, a Linnæan genus of insects, now forming the tribe *rhynchophora*, of the order *coleoptera*, and section *tetramera*. They are remarkably characterized by the prolongation of the head into a beak or snout, at the extremity of which the mouth is placed, and from which the club-shaped antennæ spring. Some of them have straight antennæ; but the greater number have the antennæ *geniculated*, or bent forward at the second joint. The species are very numerous, and are distributed over all parts of the world. They all feed on vegetable food, both in their larval and in their perfect state; and some of them are notable for the mischief which they do in the former state to the young shoots, leaves, fruits, and seeds of plants. They are diurnal insects, many of them very small, but others of considerable size. They are slow, timid, and defenseless; although the long hard beak suggests to those ignorant of its real nature and of their habits an idea of danger in handling the larger species. Many of them are of very dull and uniform color; but some are among the most beautiful of the coleoptera—resplendent with the finest hues, and brilliant as gems. Such is the well-known diamond beetle (q.v.) of South America. The larvæ of weevils are soft, white, and footless, with very convex rings, hard heads, and horny jaws. The perfect insects are often found on leaves and in flowers of the particular kinds of plants on which they and their larvæ feed. *Rhynchites betuleti*, a weevil often very injurious to vineyards, constructs a nest for its larvæ by rolling up the leaf of the vine, piercing the roll as it proceeds, and depositing eggs between the folds in the inner part of the roll. The larvæ feed upon the leaf, which the parents further adapt for their use by cutting the leaf-stalk half through, so that the leaf hangs down, and by the time they are ready to change into the chrysalis state, it drops off, or is blown off by the wind, when they bury themselves in the ground to wait for the return of spring. Other trees, as the pear-tree, are infested by weevils which destroy their leaves in a similar manner; the leaves of some, as of the peach, often suffer injury from weevils, which devour them, like caterpillars, without rolling them up; and turnips are subject to the ravages of certain small species of weevil, which proceed in the same manner. Some species of weevil gnaw young shoots. The shoots of fruit trees, and young grafts, are sometimes destroyed by weevils, which bore into them by means of their beak, and make a small chamber in the center, in which an egg is deposited, being pushed into its proper place by the beak. The shoot is then cut through a little lower down, and the parent weevil may be seen climbing upon it, when the operation is nearly completed, to make it fall by her weight, and returning again to her work, if it is not yet ready to fall. She lays about two eggs a day, but continues her operations for many weeks, so that much destruction is effected. The larva feeds on the pith of the fallen shoot, and deserts it when ready to become a chrysalis, to bury itself in the ground.—The larva of a large species of weevil (*calandra palmarum*) inhabits palm-trees in South America, feeding on their central part, and is eaten and esteemed as a delicacy. When roasted, it almost melts into grease; but its flavor is said to be remarkably fine. This weevil is black; about an inch and a half long; its larva is between two and three inches long. Another species (*calandra saccharı*) is very destructive to the sugar-cane. Its larva is also eaten in the West Indies and Guiana.—The wood of pines and firs is the food of certain kinds of weevil, so that plantations suffer severely from their ravages. Thousands of acres of pines in the southern states of America have been destroyed by a weevil (*hylobius pales*), not much more than a quarter of an inch in length; and some of its congeners in other countries are scarcely less destructive, as *hylobius abietis* in Europe. There are many species of weevil which attack leaf-buds and flower-buds. Thus *anthonomus pomorum* infests the apple-tree, depositing its eggs in the flower-beds, and cutting off the prospect of fruit. *Anthonomus pyri* is equally injurious to the buds of pear-trees. Some species of *rhynchites* lay their eggs in fruits—as apples and plums—at an early stage of their growth, cutting the fruit-stalk, that the fruit may fall to the ground. The European nut-weevil (*balaninus nucum*) lays its eggs in young hazel-nuts, upon which the larvæ feed as the nuts grow; a nearly allied species attacks, in like manner, the hazel-nuts of America, and another

infests acorns. The pea-weevil (q.v.) feeds upon peas; and other leguminous plants have their peculiar species, which devour their seeds. The corn-weevil (q.v.) is very destructive to wheat, and other similar species to maize, rice, and other kinds of grain. See illus., BUTTERFLIES, BEETLES, ETC.,

WEFT, or WOOF, the thread which, in weaving, is passed by the shuttle backward and forward through the warp. See WEAVING.

WEIGELA, a shrub brought from China, and named *Weigela rosea,* after Weigel, a German botanist. The correct botanical name is, however, *diervilla,* this generic name having the precedence, but the plant is commonly known by the name *weigela.* There are two native plants, known as bush honeysuckle. The northern species, *diervilla trifida,* is common in the middle and northern states, extending to Hudson's bay and to the Rocky mountains. It grows from 1 to 4 ft. high; leaves oblong-ovate and having petioles; pale yellow flowers, usually three on a stalk, from the axils of the upper leaves. The southern species, the *d. sessilifolia,* grows along the southern Alleghanies, and has sessile leaves. The list of varieties of the foreign species is long, and the colors vary from white to deep rose. This genus differs from *lonicera* in having a nearly regular corolla and a many-seeded, two-valved pod.

WEIGHING-MACHINES. The great majority of weighing-machines are founded upon the principle of the lever (q. v.), the chief exceptions being the various forms of the spring-balance (q. v.), to which might be added (though in such cases the term "machine" is quite inapplicable) some of the methods employed to determine specific gravity, time of oscillation, etc. The simplest and primitive form of weighing-machine is the balance (q. v.) with equal arms, which can be adapted either to the maximum of accurate weighing or to the most rapid equiponderance. But as this machine necessitates the *placing* in one scale of weights equal to the weight of the goods, it was soon found to be more convenient to employ a lever with unequal arms—the goods to be placed in the scale attached to the short arm, and therefore equipoised by less weights, the ratio of the weights in the two scales being in proportion to the ratio of length of the arms. On this principle the *steelyard* (see BALANCE), the *bent lever balance* (see BALANCE), and the *cart-steelyard* are constructed. But the convenience of equipoising a greater weight by one much less is counterbalanced by a considerable diminution in accuracy—one of the causes of error being the greater liability to flexure of the longer arm of the lever; and another, the necessity, for convenience' sake, of having the arm which is affected by the goods to be weighed as short as possible—the latter of itself reducing the accuracy of the steelyard to that of a symmetrical balance, whose arms are each equal to the short arm of the steelyard. However, on behalf of the steelyard, there is again the advantage of rapid equipoise. Each of these machines is variously constructed, the modifications having reference either to convenience of use, or to the species or weight of the goods to be weighed; an example of the former is the equal-armed balance, made in an inverted manner, with the scales above, and the rods which connect the scales with the beam so united as to preserve their perpendicularity during oscillation; and the latter is appropriately illustrated by the form of cart-steelyard given in figure. The dotted lines, DD, DD, indicate the grooved plates on which the wheels rest; E, E, E, E are the four points supporting the wheel-plates on the two triangular levers, CBB, CBB; the triangular levers are supported by the hooked extremities of their bases, B, B, B, B, upon fixed supports, A, A, A, A; while their vertices, C, C, are attached to a lever, FG, whose fulcrum is at F; G is attached by a chain to H, the extremity of a lever of the first kind, whose fixed support is at K, and on whose other arm (graduated) the weights for equipoising the cart and its load are placed. The machine is thus seen to be compound, consisting of the two triangular lever pieces, of a simple lever of the second, and of one of the first kind; the weight L, if sufficient, raising H, and with it G, and thence raising C, and so balancing the downward pressure of the cart and its load at E, E, E, E. Automatic weighing machines, that are set in motion by dropping a small coin in a slot, have lately become familiar to the American public. Torsion balances in which the twisting of a wire takes the place of a pivot have come into use recently and are remarkably sensitive.



WEIGHTS AND MEASURES. For the proper carrying on of mercantile transactions, and for many other purposes, it is necessary that there be fixed and readily accessible standards of magnitude, of weight, and of value. The lengths implied by the names *a foot, a hand, a cubit, a fathom,* are far too indefinite to have long continued to satisfy the wants of civilized nations; and in every country, by common consent, or by the action of government, determinate measures have been agreed upon. These measures, left almost to chance, have been different from one nation to another, even from county to

county, sometimes from town to town, and still more awkwardly, often from one trade or guild to another.

Any one can appreciate the inconvenience of such a want of uniformity, for, in every transaction extending beyond his own sphere, he has to take account of the change of measure, the change of weight, the change of money, perhaps of all three at once. We all see and allow that there ought to be only one system of weights and measures in one country; that one bushel in Winchester, another in New York—one acre in England, another in Scotland, and a third in Ireland; that troy weights, avoirdupois weights, and all the other local, conventional, and trade variations which abound in the British dominions, form an aggregate of unbearable confusion, leading to endless mistakes and ceaseless quarrels. It is not more difficult to extend our observation, and perceive that if one system be advisable for one country, a universal cosmopolitan system would be no less advantageous for the whole world.

The only practical method of establishing a system of measures is to construct standards of reference, and to preserve these carefully in some public place. In order that these standards may not be worn and injured by too frequent use, it is convenient to have authenticated copies deposited in the various towns, so that all dealers and artificers may have ready access to them, and so that all makers of weights and measures may be without excuse for errors in their workmanship.

To set up a standard of measure seems to be a very simple matter—the authorities have only to fix upon the proper length of a yard, to have a piece of wood or of metal made to that length, and to cause it to be properly marked and preserved. For common purposes this seems to be quite enough: however, experience soon shows the inconvenience of this simple plan, for, by repeated contacts, the ends of the yard-measure get worn. Instead, therefore, of making a rod just a yard long, they make it a little longer, and upon it form two fine marks a yard distant from each other, and hold this distance to be the true standard. By this expedient the effects of wearing are got rid of; copy after copy can be compared with the original, without deterioration of the standard.

But use is not the only cause of deterioration: wood decays or is worm-eaten, and metals are liable to oxidation, so that the material has to be carefully chosen. This is not all. Every substance which has been examined is found to change its size with a change of temperature; the standard bar is shorter in winter than in summer, and the change, though it be so small as to be of no moment to the haberdasher, the wright, or the mason, is enough to cause great trouble to those engaged in very accurate work. Hence, in the selection of the substance to be used for the standard bar, we must have an eye to smallness of expansion as well as to durability. The substances available, taken in the order of their expansibility, are: *deal, glass, platinum, gold, silver, iron, brass, copper.* Deal may be put aside as wanting in durability, and the choice may be said to lie between glass and platinum, neither of which is much acted on by the air, or by the vapors which are found in the atmospheres of large towns. The fragility of glass and the costliness of platinum are objections; but the latter is a mere trifle when a national standard is concerned. Platinum, then, seems to be the best substance.

The standard measure for the British empire is a brass rod, into which two pins of gold are inserted; the upper surfaces of these are sunk to the half thickness of the bar, and a small dot is made in the middle of each. The distance between the centers of these dots, taken when the temperature is at 62° Fahr., is declared to be the true yard.

In the same way as the standard of measure so must the standard of weight be established. A piece of heavy metal is made of the desired weight, and is duly authenticated. The preservation of the standard of weight is a matter of very considerable difficulty. Every occasion on which it is used, each removal of dust from its surface, the actions of the oxygen of the air and of the products of combustion which are always floating about, produce a sure though slow waste; and all that can be done is to retard this waste as much as possible. Perhaps a lump of platinum would make the best standard; but its softness is a decided objection.

In the use of a standard of weight another matter has to be taken into consideration. The apparent weight of any substance is less than its true weight by the weight of as much air as is displaced by it. Now, the density of the air is not constant—air, when warmed, expands very much more than any solid body; and therefore a piece of metal appears to weigh more in warm than in cold weather. Not only so, air is rendered more dense by an increase of pressure, and so, when the barometer is high, all heavy bodies become apparently lighter; when the barometer sinks they appear to become heavier. Thus the apparent weight of the standard pound is continually changing. If we accurately adjust two weights of brass when the barometer is low and the air warm, and afterward compare them when the barometer is high and the weather cold, we can perceive no change, for, though each has lost weight, they have lost alike. But if we had adjusted a weight of iron to a weight of platinum in light air, and again compared them in dense air, the change would have been at once seen. For, since a pound of iron is more bulky than a pound of platinum it displaces more air, and its apparent weight undergoes a greater change than does that of the platinum. Fortunately, these changes are too small to have any perceptible influence on mercantile transactions, yet they are sufficient to create the necessity for it being enacted that the standard weight must be held as true when the air is in a specified state as to warmth and pressure. The stand-

ard brass pound, which serves for the British empire, is to be used when Fahrenheit's thermometer is at 62°, and the barometer is at 30 inches. (See note.)

The thought naturally arises, what if, in the course of time, the original standards be lost or destroyed?

Time was when a seed of wheat gathered from a well-ripened ear served sufficiently well to define a grain weight; and even now the eastern jewelers weigh their gems against the *carat* or carob-bean, the hardness and uniformity of which seem to justify the selection of it. But for the extended purposes of modern commerce, and particularly for the more delicate requirements of scientific research, it is indispensable that we find some unchanging object of comparison; and none can be preferred to the earth itself as the most universally acceptable and as the best defined. For the purposes of geographers and navigators, the circumference of the earth is divided into degrees and minutes, the length of one minute being the geographical or nautical mile; and it certainly would have been convenient if the common or statute mile had agreed with this. The dimensions of the earth are now known with a precision far greater than is needed for ordinary purposes; the entire length of the circumference of a meridian circle being 131,236,000 of our standard feet, so that the length of a nautical mile is 6,075 ft. and about 9 in.; and it is highly probable that subsequent and more accurate measurements will not alter this determination more than an inch or two either way. It is usual to divide the minute into 60 seconds, so that a second of the earth's circumference is 101.25, and thus if our standard foot had happened to be one-eightieth part longer than it is, there would have been exactly 100 ft. in a second, and 6,000 ft. in a nautical mile. When we reflect on the disparity of the foot used by different nations, and recollect that 100 Vienna ft. make 103.6 English, as many Amsterdam feet 92.7, as many Berlin feet 99.2, we can hardly help regretting that our forefathers had not happened to hit upon the exact 100.

The ancient Greeks were fond of dividing into sixties; this division still continues in our scales for angles and for time; and it is worthy of remark, that if we divide the whole circumference of the earth into 60 parts, each of these into 60, and again each into 60, we arrive at a distance of 607.5 English feet. Now, the length of the ancient Greek stadium or furlong is stated to be 606¼ ft. by some writers; and if deduced from measures of the Roman mile, is between 605 and 613 ft.; so that if we desire a cosmopolitan standard, we can hardly do better than go back to the ancient Greek *stadium* or the Chinese *li*, corrected to suit the more accurate determination of modern times: this would bring us to the geographical foot, one-hundredth part of a second of the earth's meridian.

The standard of weight is readily connected with the standard of measure. Some substance which can be easily obtained pure is chosen, and a definite bulk of it is weighed. Distilled water is universally selected for this purpose; and in the British system the weight of one cubic inch of pure water is declared to be 252.458 grains when it is at the temperature of 62° Fahr.

It has long been known that water does not continue to contract as it is cooled; the contraction becomes less and less as the temperature approaches to 41° or 39° Fahr.; and the water, when cooled more, begins to expand, and continues to grow more bulky until it be on the point of freezing. On this account it has been proposed, and without any doubt it would be the best plan, to take water when at its greatest density as the standard for comparison, because then an error of a degree in temperature will produce no perceptible error in the weight.

The operation of verifying the standard of measure by comparing it with the size of the earth is necessarily an expensive and a complicated one, only to be attempted under the auspices of a wealthy government, or with the concurrence of several nations; and it is desirable to find out something more local and more easily obtained wherewith to compare our measures. The length of the pendulum (q.v.) has been proposed; and, on account of a very simple and beautiful property of pendulums, the comparison can be readily made. If we imagine an excessively minute heavy body to be suspended by a thread so fine that the weight of the thread may be neglected, the compound so formed is called a simple pendulum; and the question becomes, what must be the length of such a pendulum in order that it may vibrate from side to side in, say, one second of time? Now, it is clear that we cannot obtain this length by direct experiment, since we cannot construct such a pendulum. M. Biot tried to approximate to it by using a small ball of platinum hung by a very fine wire. However, it is known that if a heavy rigid mass be suspended by a knife-edge, and if its vibrations be made in the same time with those of a simple pendulum, then if we place another knife-edge at a distance from the first equal to the length of the pendulum and reverse the ends, the compound pendulum will again vibrate in the same time as before. Hence we have a very simple method of comparison. Having constructed a strong bar with two knife-edges at a known distance from each other, say at the distance of a yard, let us then, by many trials, filings, and scrapings, so adjust it as that the times of vibration shall be alike for the two knife-edges, and, finally, let us count how many vibrations such a pendulum makes per day, and then we shall have a means of verifying our measure.

The act of parliament which fixes our present weights and measures enacts that the length of a pendulum vibrating in one second of mean solar time is 39.13929 in.; now the lengths of pendulums are proportional, not to the times in which they vibrate, but

to the squares of those times; and so if we know the length of one pendulum, and the number of vibrations it makes per day, we can calculate what ought to be the length of another to vibrate a given number of times. A convertible pendulum having the distance between its knife-edges exactly 36 in. ought to make 90088.42 vibrations per day.

When only a degree of accuracy sufficient for commercial and ordinary purposes is aimed at, the above process is by no means difficult; but when extreme precision is wanted, the operation is attended with many and very great difficulties; it involves considerations which would hardly have been expected. In the first place, our experiments are made in air, and the buoyancy of the air lessens the actual weight of the pendulum; that buoyancy has to be allowed for, and therefore it is declared that the above length is that of a pendulum vibrating in a vacuum. Next, since the earth has a diurnal motion on its axis, every substance placed on it has a centrifugal tendency which goes to modify what otherwise would have been its gravitation; this centrifugal tendency produces the earth's oblateness, and causes a variation in the intensity of gravitation from one latitude to another. A stone is actually heavier in Edinburgh than it is in London. This change in gravitation cannot be measured by a balance, because the weights at each end of the balance are changed alike; but is seen at once in the going of a clock; for a pendulum regulated to go truly in London is found to go too fast when taken to a higher latitude, and to lose time when carried nearer to the equator. Hence, the enactment that the pendulum must be swung in the latitude of London. And again, the attraction which the earth exerts upon bodies placed near it diminishes with their distances, being inversely as the squares of the distances; hence, a clock carried from the bottom to the top of a hill loses time perceptibly, and so it is necessary to have the additional enactment that the pendulum be swung at the level of the sea.

In addition to these niceties, there are others connected with the manipulation, such as the parrallelism of the knife-edges, their bluntness, the extent of the area of oscillation, and the stability of the supports, so that altogether the exact measurement of the length of the seconds pendulum is a matter of very great complexity. All these difficulties and troubles notwithstanding, we may hold that for all practical purposes, our system of weights and measures—and it may be added, the systems of all other civilized nations—is perfectly well established, whether it be regarded as derived from the dimensions of the earth, or from the intensity of gravitation.

No system of measures can ever claim to be of universal application from which geographical dimensions are excluded. It is essential that the unit of measure bear some simple relation to the earth's circumference, for otherwise the operations of the surveyor will not accord with those of the geographer. the only question, therefore, in regard to the establisment of a cosmopolitan system, is as to the number of parts into which the earth's circumference is to be divided. Now, the denary system of numeration has already asserted its supremacy; one by one the schemes followed by different nations have given way to it, and their very languages have been modified by its influence; sufficient traces remain to show how extensive these modifications must have been. The *three-score and ten* is not yet forgotten in English, nor the *quatre-vingt dix neuf* in French. In many trades the counting is still in dozens and grosses; yet our merchants count their interest, their discount, and their dividends in cents. The surveyor divides the foot on his leveling staff into tenths, hundredths, and thousandths; he makes his Gunter-chain of 100 links. The astronomer no longer divides the second into sixty thirds, but into hundredths; he gives his equinoctial time in decimal fractions of the day, and he makes the arguments for the planetary disturbances in thousandth parts of the whole revolution. There is no single instance in which the decimal system, once adopted, has been abandoned. An English statute, the weights and measures act, 1878, has been passed, which, while making no material change so far as mercantile matters are concerned, places the system on another and most unsatisfactory foundation. The standard of length is still the distance between the same two gold pins, but the standard of weight is now declared to be a platinum pound avoirdupois to be weighed *in vacuó*. The act contains no instructions as to how this is to be compared with any weight in air, nor does it narrate any connection between the brass weight of 5,760 grains in air, with the platinum one of 7.000 grains *in vacuo*. Further, the whole of the old act is repealed, so that there is now no connection between the standards of measure and of weight, nor between these and any natural or recognizable quantity. We are thus carried back to the rudest of all foundations, an arbitrary weight and an arbitrary measure. The fruits of laborious scientific research are put aside.

Weights and measures have, since the year 1824, been in great measure regulated by statute. The statute 5 Geo. IV. c. 74 was passed to enforce uniformity in the weights and measures used in various parts of Great Britain and Ireland; and a standard yard was defined as being then in custody of the clerk of the house of commons, and it was enacted that all superficial measures should be computed and ascertained by the said standard yard. The act also described how, if the said standard yard were to be lost or destroyed, another was to be made. So the statute defined a standard brass weight of one pound troy, and a standard gallon. That statute was altered by a subsequent statute of 5 and 6 Will. IV. c. 63, and inspectors were authorized to be appointed by justices of the peace, who had power to examine and stamp weights and measures.

It was enacted that any contract, bargain, or sale made by any weights or measures unauthorized by the act should be wholly void, and every such weight might be seized by the inspector, and forfeited. One or two exceptions were made by the act—such as weights above 56 lbs.; wooden or wicker measures used in the sale of lime; glass and earthenware jugs or drinking-cups, though represented as containing the quantity of any imperial measure, or any multiple thereof, and these are not illegal, though incorrect. The act 41 and 42 Vict. c. 49, to consolidate the body of existing law on the subject, insists on uniformity in the use of imperial weights and measures, defines the standards of weight, length, and capacity as specified in the note on the previous page, gives the penalties for unjust measures, regulates the stamping and verification of weights and measures, and prescribes how the law should be administered. See GRAM, LITER, METER; METRIC SYSTEM.

WEIMAR, a small but interesting t. of Germany, capital of the grand-duchy of Saxe-Weimar-Eisenach, and residence of the grand-duke, 59 m. s.w. of Leipsic by railway. It stands in a pleasant valley on the left bank of the Ilm; but the environs are in no way remarkable, and the town itself is irregularly and rather poorly built. Though the residence of the court, and finding its subsistence in providing for the wants of distinguished visitors, Weimar carries on neither trade nor manufactures, and seems a dull provincial-looking town. The luster conferred upon Weimar by the residence here, at the close of the 18th and the earlier portion of the 19th centuries, of Goethe (q.v.), Schiller (q.v.), Herder (q.v.), and Wieland (q.v.), at the court of Karl-August (see SAXE-WEIMAR-EISENACH), has faded since that group was broken up by death; and now the interest of the town is almost wholly derived from its monuments, traditions, and associations. The town church (*stadtkirche*), dating from the year 1488, has an altar-piece by Cranach, and contains a number of memorable tombs, among which are those of the brilliant soldier, Bernhard (q.v.) of Weimar, and of Herder, the philosopher and critic. The ducal palace is a handsome building, some of the apartments of which are decorated by frescos illustrating the works of Goethe, Schiller, Herder and Wieland. The public library contains busts of these men of genius; and a number of relics, as the gown worn by Luther when a monk, and Gustavus Adolphus's leather belt, pierced by the bullet that caused his death at Lützen. The houses of Goethe, Schiller, and Herder are still pointed out. The two former of these poets lie interred in the grand-ducal burial-vault. The park and gardens of the palace, within which is the summer residence of Goethe, are much esteemed as a promenade. Pop. '80, 19,944; '95, 26,670.

WEIR, or WEAR—called also a dam, and in the n. of England and s. of Scotland a cauld—a structure placed across a river or stream for the purpose either of diverting the water into a mill-lade, of raising the level of the surface of the river and thereby increasing its depth for the purpose of navigation, or of providing the means of catching salmon and other fish. There is also the waste-weir, for the purpose of preventing a reservoir embankment being overtopped by floods; and the gauge-weir, for the purpose of computing the quantity of water flowing over it, from a measurement of the difference of level between the crest of the weir and the surface of the still water above it. The word is also sometimes used, though perhaps not quite correctly, to denote a training-wall or other structure parallel with the general line of a river, for the purpose of remedying or preventing loops or sinuosities. A weir may—according to the purpose for which it is intended, to the nature of the materials at command, or to other circumstances—be formed either of stone, timber, or brushwood, or a combination of any two. It is generally placed obliquely across the stream, in order to make the length of its crest considerably greater than the width of the channel, and thereby prevent the water in floods from rising to so great a height as it would do with a shorter crest, to the risk of damaging the adjoining low lands, and probably putting the mills above in backwater. In such cases the mill intake or the navigation lock, as the case may be, is generally placed at the down-stream end of the weir. Much obliquity, however, makes the current to impigne against and cut into the side of the river opposite the lower face of the weir, and to prevent that effect weirs are sometimes made of the shape of two sides of a triangle, or rather of that of an hyperbola, with its apex pointing up stream, which arrangement is peculiarly applicable to the case of there being an intake for a mill on each side of the river, and the apex is a very suitable place for a fish-pass or ladder. Not unfrequently, when at a wide part of the river, the weir is placed at right angles across, and with a slight curve upward; and a natural shelf of rock is often very advantageously made use of for either a mill or fishing weir, the low parts being made up where necessary with stone or timber.

The down-stream face of a weir is generally a pretty flat slope of stone "pitched" or set on edge, and with its toe, or lower edge, either sunk into rock, or protected from being underwashed by a row of timber-sheeting piles, and frequently also by an apron of timber-planking. The slope is either straight, or made with a hollow curve, so as to check the tendency of the water to acquire increasing velocity as it descends; and it is frequently divided into panels by timber-framing, so as, in the event of a portion of the pitching being washed out, to lessen the risk of the whole of it being carried away. The up-stream face is generally a slope dipping into the water, and protected by stone pitching, but it is sometimes a perpendicular wall. In order to render an ordinary sloping

weir water-tight, sometimes there is under the crest or coping a row of well-jointed and close-driven timber sheeting piles; but those being liable to decay, without their decay being visible, a better, though a more difficult and expensive arrangement, is to build a perpendicular wall of water-tight masonry under the crest. In either case, generally there is the additional precaution taken of having a wall of pounded clay on the upstream side of the wooden or stone barrier; and sometimes a mere wall of pounded clay alone, in the center of the weir, is trusted to, as the sole means of making it water-tight; but the latter is not a satisfactory arrangement.

WEIR, Julian Alden, b. West Point, N. Y., in 1852; son of Robert W., and younger brother of John F. (both members of N. A.). He studied painting with his father, and took a studio in New York, devoting himself especially to portrait painting. For some years he resided in Paris, where his heads have attracted considerable attention. He has exhibited at the National acad., New York, "A Brittany Interior," 1875, "At the Water-Trough," and "Study of an Old Peasant," 1877. His "A Breton Interior" appeared at the Paris exposition, 1878.

WEIR, Robert Walter, 1803–89; b. N. Y.; studied art in Italy, and returned to this country in 1827. He was for four years, 1830–34, professor of perspective in the national academy of design, and in 1832 became instructor in drawing at West Point, where he held a professorship, 1846–74. His best pictures are: "Embarkation of the Pilgrims" (now in the capitol rotunda at Washington), "View of the Hudson from West Point," "Indian Captives," "Landing of Hendrik Hudson," and "Columbus before the Council of Salamanca." John F., his son, is also a painter of some note, and is professor of painting and design at the Yale school of fine arts.

WEISBACH, Julius, 1806–71; b. Germany; educated at Freiberg, Göttingen, and Vienna. In 1833 he was called to the chair of applied mathematics in the Freiberg academy. His principal work is *Lehrbuch der Ingenieur-und-Maschinenmechanik*, (1854).

WEISHAUPT, Adam. See Illuminati.

WEISMANN, Dr. August, eminent German biologist, was born in 1834. His father was professor of philology in the Lyceum, at Frankfort-on-Main. The son studied medicine at Göttingen from 1852–56. The following year he visited the Universities of Vienna and Paris, and later that of Giessen, where he became interested in Leuckart's lectures in zoölogy. From 1860–62 he acted as physician-in-ordinary to Archduke Stephan, of Austria, at Castle Schaumburg, near Ems. Impaired eyesight forced him to suspend all microscopic work during the next 10 years. A warm admirer of Darwin, whom he has aptly called the Newton of biology, Dr. Weismann became a close student of his theory of evolution, and between 1868 and 1876 published *Studies in the Theory of Descent*, which commanded instant attention among scientists. In the preface to the English translation of this work, which appeared in 1882, Darwin wrote: "At the present time there is hardly any question in biology of more importance than the nature and cause of variability (in individuals)." Since the death of the great English scientist, however, Dr. Weismann has developed his theory of descent on purely original lines, and in the face of strong opposition on the part of the Darwinian school of to-day. It may be said that he conceives the germ-plasm as the basis of heredity, or, to use a simple illustration, it is the eggs that have been forming the hens, and not the hens the eggs. In all animals above those consisting essentially of a single cell, this continuity of life (from individual to individual in genealogical series) is confined to the generative cells, and it is the other, or somatic cells alone that are necessarily mortal. He denies the transmission to a descendant of any quality, including contagious disease, acquired by individual after birth, and challenges the Darwinian view that certain individuals develop parts and organs more than others, and then transmit to their descendants. Sexual reproduction he regards as a stupendous organization, by which nature is ever mixing together, and forming new combinations of the hereditary qualities of a whole species. Dr. Weismann's principles are now generally accepted by the foremost scientists of Germany, where he has occupied the chair of zoölogy in Freiburg University since 1866, but in England the heated controversy which arose on the promulgation of his germ-plasm theory is still active, thanks to Herbert Spencer and others (see *Contemporary Review*, 1893–95); on the other hand, he is not without followers there, too; witness Benj. Kidd, author of *Social Evolution* (1894). Among his principal writings and essays are *On Heredity, Life and Death; The Continuity of the Germ-Plasm; The Significance of Sexual Reproduction; On the Number of Polar Bodies and their Significance in Heredity, etc.*; also *Essays on Heredity and Kindred Biological Problems* (1889), and *Germinal Selection* (1895).

WEISSENFELS, a t. of Prussia, in the government of Merseburg, and 25 m. w. of Leipsic, on the Saale. Pop. '90, 23,779.

WELBY, Amelia B. (Coppuck), 1819–52; b. Ky.; married George B. Welby, a Louisville merchant in 1838. Her first poetical efforts appeared in the Louisville *Journal* over the signature of Amelia. Collections of her poems were published, 1844, 1850.

WELCKER, Friedrich Gottlieb, one of the most distinguished scholars of Germany, was b. in the year 1784 at Grünberg, in Hesse-Darmstadt; studied at Giessen; was appointed one of the masters of the gymnasium there in 1803; and in the year 1806, traveled to Rome, where he remained two years. Here he became acquainted with the celebrated Danish archæologist, Zoega, whose life and essays he afterward published.

and by whose example he was stimulated to that subtle appreciation of the works of ancient art which appears everywhere in his works. On his return from Italy, he was appointed to a professorship of ancient literature, first in Giessen, then in Göttingen, and finally (1819) in the newly erected Prussian university of Bonn, which continued to be the scene of his scholarly activity till his death in 1868.

Welcker belonged to that class of scholars who, since Heyne and Wolf, have given such a lofty inspiration, such a philosophical significance, and such a historical comprehensiveness to those studies which, for want of a better name, we are forced still to designate philology. But philology in this country generally means the history and philosophy of language; with the Germans, as it did originally with the Alexandrian Greeks, it means, the sympathetic understanding and the imaginative reconstruction of the life and thought of famous ancient peoples, based on the critical treatment of ancient documents, or the tasteful appreciation of the monuments of ancient art. It is needless to say that this "philology" is a very different thing from the minute verbal and metrical preciseness which was long the leading characteristic of scholarship in this country. For however important these minutiæ may be in their place, they are manifestly valuable only as means to an end; and even when the end has been steadily kept in view, it cannot be denied that some of our greatest intellects have spent more of their strength on these subsidiary matters than their importance deserves. In Welcker, Otfried Müller, and other German scholars of the first class, we see a general reaction against this narrow school; and a reaction which was sure to prosper, as it was based on thorough academic training, and had learned to neglect no trifle and despise no minute point which could be made subservient to higher purposes. If it was the fault of German scholarship generally that it was too professional and too academic, it is the praise of Müller, Welcker, and the school to which they belong that they have bridged over the gulf which separates learning from life, and inspired the dry bones of tradition with a spirit which makes them intelligible to the present, and significant of the future. The long academic career of Welcker was distinguished by an uninterrupted course of scholarly activity. Many of his works are tracts and essays on archæological subjects without external unity, but all exhibiting a remarkable combination of extensive and accurate learning, fine taste, delicate sensibility, and sound judgment. We can only note here his three most important works of a larger compass. The first is the *Æschylean Trilogy* (1824), in which the organic connection and sequence of the Greek dramas are set forth with a richness of constructive detail not altogether free from that fanciful and problematic element which is one of the most distinguishing characteristics of German scholarship. The second is the *Epic Cycle* (1835–49), a work which has done great service to the right appreciation of early Greek literature, by taking Homer out of that region of mysterious isolation in which he had been previously allowed to remain. The third, and perhaps his greatest work is the *Götterlehre*, or Greek Mythology (1857–62), which embraces all that is good, and rejects all that is bad in the wide German literature of this subject, with a delicate tact and a just discrimination as valuable as they are rare. Of all Welcker's works, this is the one that would most probably bear with credit the ordeal of an English translation.

WELD, a co. in n. e. Colorado, bounded by the territorial lines of Wyoming and Nebraska; drained by the South Platte river and its affluents; 4075 sq.m.; pop. '90, 11,736. Co. seat, Greeley.

WELD, or Woold, also called Dyer's Rocket, Dyer's Weed, and Yellow Weed (*reseda luteola*), is a plant of the same genus with Mignonette (q.v.), a native of waste places in England, very common in Germany and in many parts of Europe. It has an upright stem; 2 to 3 ft. high; lanceolate, undivided leaves; and long racemes of small yellow flowers, with 4-partite calyx and prominent stamens. It is used for dyeing. In order that it may yield a good dye, it requires to be cultivated with care. The best is grown in France, England, and Holland; and that produced about Cette, in France, is preferred to all others. Good weld must have flowers of a beautiful yellow or greenish color, and abound in leaves; that which is small, thin-stemmed, and yellow, is better than that which is large, thick-stemmed, and green; that which grows on dry sandy soils is better than that produced on rich and moist soils. It was formerly cultivated to a much greater extent in Britain than it is at present, and was also more used by dyers than it now is. Weld is still, however, a valuable dye-stuff. It serves equally for linen, woolen, and silk, dyeing not only a rich yellow, but, with proper management, all shades of yellow, and producing a bright and beautiful color. Stuffs previously dyed blue are, by means of weld, changed to a very pleasing green. Large quantities of weld are imported from France.

WELD, Angeline Emile (Grimke). See Grimke, Angelina.

WELD, Theodore Dwight, b. Conn., 1803; entered Hamilton college, but did not graduate. He also entered Lane theological seminary, but withdrew to Oberlin, as did all the students except six, on the suppression by the trustees of the anti-slavery society in the former seminary. He lectured on abolition till 1836, when, having lost his voice, he became editor of some of the publications of the American anti-slavery society. In 1854 he organized a school in New Jersey; ten years later he settled in Massachusetts, where he still (1881) resides. Besides many pamphlets for the anti-slavery society, he has written *The Bible Against Slavery*, and *American Slavery as it is.*

WELDE, Thomas, 1590–1662; b. England; graduated Cambridge, 1613; minister at Tarling, Essex; came to America, 1632; was the first pastor of the church at Roxbury; opposed the religious views of Anne Hutchinson at her trial, 1637; aided Eliot and Mather in the preparation of the *Bay Psalm Book;* went to England with Hugh Peters as agent for the colony, but did not return; was pastor of a church at Gateshead, but ejected for non-conformity, 1662. He published *A Short Story of the Rise, Reign, and Ruin of the Antinomians, Familists, and Libertines that infested the Churches of New England.*

WELDING, the process by which some substances are united together in a softened state. It is generally applied to such metals as malleable iron, two pieces of which, heated to redness, may be made to unite by applying them together and beating with a hammer. Other substances, such as horn and tortoise-shell, can be welded by first making separate pieces soft by heat and pressing them together, which causes so intimate a union that no traces of the junction remain after cooling.

WELLAND, a co. in s. Ontario, Dominion of Canada, having the Niagara river for its e. boundary and lake Erie on the s.; 257 sq. m.; pop. '91, 25,132. It is drained by the Welland river, and intersected by the Welland canal. Co. seat, Welland.

WELLES, Edward R., d.d., b. N. Y., 1830; graduated Hobart college; ordained in the Protestant Episcopal church, 1857; minister of a church at Red Wing, Minn.; prominent in general convention; consecrated bishop of Wisconsin, 1874. D. 1888.

WELLES, Gideon, 1802–78; b. Conn.; educated at Norwich university, and called to the bar. He was originally a democrat; was editor of the Hartford *Times*, 1826–37; and an adherent of Gen. Jackson. He served in the legislature, 1827–35, was postmaster of Hartford during Van Buren's administration, and comptroller of the state, 1842–46. He joined the republican party upon its foundation; was the head of the Connecticut delegation to the republican national convention in 1860, and was secretary of the navy, 1861–69.

WELLESLEY, a province on the w. coast of the Malay peninsula, opposite the island of Penang; bounded n. by Quedah, e. by Siam, w. by the strait of Malacca. Several native states on the s. lie between it and the British province of Malacca. The province is 45 m. long and 8 wide, containing an area of about 270 sq. m.; pop. abt. 108,117, mostly Malays. It is under the lieutenant-governor of Penang, and is one of the Straits Settlements. Surface undulating; soil very fertile; climate hot. A large part of the province is cultivated, chiefly by Europeans and Chinese, who raise rice, sugar, and tapioca. Good roads have been made by the English into the interior, which is reached also by the Perak and other rivers. The province was settled by a British colony in 1800.

WELLESLEY, Richard Colley Wellesley, Marquis, k.g., English statesman, was b. at the town residence of his family, Grafton street, Dublin, June 20, 1760. The family of Wellesley was one of Saxon origin, belonging to the county of Sussex, and was among the most ancient in Ireland, one of them having gone from England as standard-bearer to Henry II., who gave him large grants of land in Meath and Kildare. William de Wellesley was in 1334 summoned to parliament as baron Noragh, and was high in favor with Edwards II. and III. The name (originally *Welesley* or *Welseley*) was written Wellesley till the 16th c., when it became abbreviated into Wesley. Mr. Garrett Wesley of Dangan, county Meath, married Miss Colley of castle Carbery; and on the decease of his son without issue the estates were bequeathed to his cousin, Richard Colley, who thereupon assumed the name of Wesley. The Colleys, originally Coweys, were also of ancient descent, and came originally from Rutlandshire. Richard Colley, who thus succeeded to the Wellesley estates, though in no way related by blood to the earlier Wellesley family, was created baron Mornington. His eldest son received (1760) the dignities of viscount Wellesley and earl of Mornington, and enjoyed the still more enviable distinction of being the father of the marquis Wellesley, the subject of this notice, and of Arthur, first duke of Wellington, by his marriage with the eldest daughter of Arthur, first viscount Dungannon. Wellesley's father, the first earl of Mornington, although chiefly known for his talents as a musical composer, was a man of great abilities. Wellesley received his education at Eton, and afterward at Christchurch, Oxford, at both which seats of learning his fame stood high. An eloquent speech was made by him at Eton as early as 1778; and in 1780 he gained the university prize for the best composition in Latin verse, in which he excelled through life. His father having died in 1781, Wellesley, on attaining his majority, took his seat in the Irish house of peers, took upon himself the pecuniary obligations of his father, and placed the estates under the management of his mother, who survived her husband for nearly half a century. The debts of the first earl were liquidated, but Wellesley was unable to preserve the family possessions. He was one of the original knights of St. Patrick when the order was founded by George III. in 1783. It appears, from a correspondence between Pitt and the duke of Rutland, that at the age of 24 he had convinced both statesmen that he was destined to distinguish himself, and to render the public essential service. Dissatisfied with the limited field of distinction which Ireland afforded him, he obtained in 1784 a seat in the British house of commons as member for Beeralston. In 1786 he became

one of the lords of the treasury, when he was elected for Saltash. Being unseated on petition, he obtained a seat for Windsor, and became a favorite of George III. Accident directed his attention to India, and in 1795 he became one of the unpaid members of the board of control. In Oct., 1797, he received a seat in the house of lords as baron Wellesley; and, at a most eventful period, was selected to go to India as governor-general. Four powers then divided the sovereignty of India—the British; Tippoo Sahib; the nizam; and the Mahrattas, comprehending Scindiah, Holkar, and the rajah of Berar; and the w. of India was the scene of invasion by Zemaum Shah. Tippoo hated the English, and meditated their expulsion from India; and the troops in the service of the nizam and the Mahrattas were officered by Frenchmen. When Wellesley arrived at Calcutta, in May, 1798, Egypt had been conquered by Bonaparte; and the native powers of India, incited by the French, were unfriendly to British rule. His first operation was one of great boldness. Disregarding the remonstrances of the Madras council, he ordered the Nizam to disband 14,000 men, surrounded them with a British force, secured the 124 Frenchmen by whom they were officered, and sent them instantly to Europe. Having annihilated French influence, he began the reduction of the empire of Mysore. On Feb. 3, 1799, he ordered Gen (afterward lord) Harris to march with an army of 20,000 men direct from the coast upon the Mysore capital. He himself removed to Madras, to be near the scene of this eventful operation. In one short month the fortress of Seringapatam was taken, Tippoo Sahib slain and his dominions partitioned. Having thus in fifteen months destroyed French influence, struck terror into the native princes, and overthrown the most inveterate enemy of British rule in India, he returned to Bengal. Up to this period he had been the earl of Mornington; he was now (Dec., 1799) created by the king marquis of Wellesley, and received the thanks of parliament. The East India company offered him £100,000 of the prize-money realized at Seringapatam, but he refused, disdaining to be enriched out of military spoil. He afterward accepted an annuity of £5,000 voted him by the court of proprietors. His next step was to place the territories of the nabob of the Carnatic under the administration of the company, in consequence of the treachery of that prince. He also concluded a treaty with Persia, to which he attributed "the fall of Zemaum Shah, the confusion of the Afghan government, and the repression of the annual project of invading Hindustan from Cabul"—then, as since, the nightmare of Indian statesmen. In 1801 he sent a force of 7,000 men up the Red sea to assist in wresting Egypt from the French. The expedition, under Gen. Baird, reached Egypt, and effected a junction with the army from England; but the French had already surrendered. In 1802, in consequence of differences with the court of directors, he tendered his resignation; but was induced to continue in office until January, 1806. The Mahratta war broke out; the battles of Laswaree, Assaye, Argaum, and Delhi were fought; and Scindiah, the Berar rajah, and Holkar were stripped of their dangerous influence and reduced to submission. A large accession of territory rewarded the gallantry of the army, and in 1805 Wellesley returned to England, after the most brilliant administration ever known in India. He had outshone even the native princes in the pomp and splendor of his progresses. He built the palace of Calcutta; founded and patronized the college of Indian literature; stimulated every attempt of natives and Europeans to bring to light the vegetable, mineral, and physical treasures of the "golden peninsula;" and inaugurated those important financial reforms which in a brief period raised the revenue of the company from 7 to more than 15 millions sterling. On his return he was received with every mark of respect and approval by the directors; but as matter of course there were many complaints that his administration had been oppressive, especially toward the native powers; and articles of impeachment were even presented to the house of commons, though they were rejected with contempt. He now prepared to enter anew upon a parliamentary career. George III. wished him to be one of the secretaries of state in the Portland cabinet, but he declined the offer. He went to Spain as ambassador-extraordinary in 1809; landed at Cadiz on the day the battle of Talavera was fought, and on Nov. 2 met his brother, the duke of Wellington, at Seville. In Dec., 1809, he was appointed secretary of state for foreign affairs; and in 1810 was elected a knight of the garter. He was favorable, both in and out of office, to the repeal of the penal laws affecting the Roman Catholics; and when, in Jan., 1812, the prince regent refused to agree to a concession of Roman Catholic claims, Wellesley resigned his seat in the cabinet. During the first ten years of the administration of lord Liverpool he remained in opposition. He protested against the insufficiency of the means placed at the disposal of the duke of Wellington, and did not cease to demand that he should be assisted to the utmost extent of the national credit and resources, until the duke had crossed the Pyrenees at the head of his victorious army, and brought the war to an end before Toulouse. When the settlement of the affairs of Europe was being arranged in 1815, Wellesley protested against the neglect of commercial interests, but without effect. He now began to ally himself with the more liberal section of the conservatives, who looked up to Mr. Canning as their leader, and accepted the office of lord-lieutenant of Ireland. Conciliation was to be the principle of his government, but he held office for 5 years without effecting any material amelioration, owing to the difficulties arising out of the state of the penal laws. He was recalled from Ireland by his brother when he took office in 1828. In 1830 Wellesley accepted the post of lord-steward of the household from earl Grey; and in 1833, in the

seventy-fourth year of his age, he again proceeded to Ireland as viceroy, where he remained until sir R. Peel's administration of 1834. In 1835, on the restoration of the whig party, he accepted the post of lord-chamberlain, which he only held for a few months. In 1837 it became known to the directors of the East India company that he was in straitened circumstances and deriving little, if any, advantage from their annuity of £5,000 per annum; they therefore resolved that a sum of £20,000 should be vested in trustees for his benefit. In 1841 it was further resolved that his statue should be erected in the court-room, as a mark of the admiration and gratitude of the East India company. He died at Kingston house, Knightsbridge, on Sept. 25, 1842, and, in compliance with his will, was buried in the vault at Eton college chapel. An authentic record of his Indian administration was undertaken by Mr. Montgomery Martin, under the direction and at the expense of the East India company, and published, in 1836, in 5 vols. 8vo, entitled, *Dispatches, Minutes, and Correspondence of the Marquis Wellesley, during his Administration in India.* A thin 8vo vol., issued in 1838, contains *Dispatches and Correspondence of the Marquis Wellesley during his Mission to Spain.* The marquis published several pamphlets on various occasions: *Substance of a Speech in the House of Commons on the Address in* 1794*; Notes Relative to the Peace Concluded with the Mahrattas; Letters to the Government of Fort George Relative to the New Form of Government established there; Letters to the Directors of the East India Company on the India Trade;* etc. He was twice married, but left no issue, and the marquisate became extinct at his death; the earldom, etc., went to his next brother, but afterward reverted to the second duke of Wellington, as son of the great duke, who was third brother.

WELLESLEY COLLEGE, situated in the town of Wellesley, 15 m. w. of Boston on the Boston and Albany railroad, was founded by the late Henry F. Durant, a lawyer of Boston. It was incorporated in 1870, and opened in 1875. The principal building stands on elevated land in the midst of grounds 300 acres in extent. It is in the form of a double Latin cross, 475 ft. long and 150 ft. wide in its greatest dimensions, and is of the Renaissance order of architecture. Three other buildings accommodate especially work in art, music, and chemistry. Stone hall and seven cottages are for dormitory purposes. The college provides courses leading to the degrees of B.A. and M.A. The requirements for admission include mathematics, Latin, and two other languages, or one other language and a science. Of the course leading to the B.A. degree only about one-fifth is required, the remainder is elective. The library contains over 46,000 volumes. The teaching force for 1896–97 numbers 76; students, 723. Presidents, Ada L. Howard, 1875–82; Alice E. Freeman, PH.D., L.H.D., 1882–87; Helen A. Shafer, M.A., 1888–94; Julia J. Irvine, M.A., LITT.D., 1894.

WELLING, JAMES C., b. N. J., 1825; graduated at Princeton, 1844; in 1848 became New York correspondent of the Washington *National Intelligencer*, with which he was connected as associate and principal editor until 1866. From 1867 to 1870 he was principal of St. John's college, Annapolis; for a short time professor of belles-lettres at Princeton, and in 1871 was made president of Columbian university, D. C. He d. 1894.

WELLINGBOROUGH, so called from the medicinal springs in its vicinity, is a town in the co. of Northampton, Eng., 10½ m. e.n.e. of the town of that name. It carries on a considerable trade in corn, boots, and shoes. Pop. '91, 15,068.

WELLINGTON, a co. in central Ontario, Dominion of Canada, drained by the Grand river; 1358 sq. m.; pop. '91, 72,716. Co. seat, Guelph.

WELLINGTON, a small market t. in the co. of Somerset, 7 m. s.w. of Taunton, at the foot of the Blackdown hills, one of which is crowned by a monument commemorative of the battle of Waterloo. The town gives title to the duke of Wellington. Blankets, serges, and other woolen goods and earthenware are manufactured. Pop. '91, 6808.

WELLINGTON, a small market-t. of Shropshire, 10 m. e. of Shrewsbury, at the foot of the Wrekin, on the Shrewsbury and Shropshire canal. The town forms the junction of several railways. It is situated in a populous mining and agricultural district, with coal and iron mines, iron works, limestone quarries, and wire-mills in the vicinity; while, in the town, there are smelting-furnaces, nail-works, and malt-kilns. The spacious public market, with town-house and assembly-room, cost about £20,000. Pop. '91, 5831.

WELLINGTON, a t. of New Zealand, the chief town of a "provincial district," and since 1865 also the capital of the whole colony, the residence of the governor, and place of meeting of the "general assembly," or colonial parliament. Wellington was the first settlement of the New Zealand company, and was planted under the direction of col. Wakefield, with a band of pioneer colonists, in 1840. The town is beautifully situated on a bay of port Nicholson, itself an inlet of Cook's strait, on the southern coast of the North Island. The surrounding country is richly wooded, but the dense forests have begun to yield to the axe of the settler. The harbor is a fine expanse of water, 6 m. long and 5 broad, and has an excellent wharf, affording accommodation to ships of any tonnage, and considered one of the best in the Australian colonies. Since the removal of the seat of government hither, the town has made very rapid progress; it possesses a

number of good public buildings; a handsome pile has recently been erected for the use of the house of representatives and legislative council. The streets are generally spacious, and have good dwelling-houses. Wellington possesses a cathedral, together with 20 other places of worship, in connection with the Episcopalians, Presbyterians, Methodists, Roman Catholics, and Jews, freemasons' hall, public library, several banks, three theaters, and extensive waterworks. The industries include flour and saw mills, tanneries, foundries, brick kilns, breweries, etc. In 1866 a regular line of steam-packets was established between Sydney, Wellington, and Panama. Wellington is also connected by steamers with all the principal ports of New Zealand. Pop. '96, 37,441, or with suburbs, 41,758.

WELLINGTON, Arthur Wellesley, Duke of, K.G., one of England's greatest generals, was the third son of Garrett, first earl of Mornington, and brother of the marquis Wellesley (q.v.). He was born May 1, 1769, at Dangan castle, Ireland, and completed his military education, a few years before the French revolution, in the military college of Angers, in France. He entered the army as ensign in the 41st regiment in 1787, and became lieut.col. of the 33d in 1793. In 1794 he embarked in command of the 33d regiment to join the duke of York's army in the Netherlands. In this, his first term of actual service, he commanded 3 battalions on the retreat of the army through Holland, and distinguished himself in several repulses of the French. In 1796 he accompanied his regiment to India, where his brother, the marquis Wellesley, shortly afterward arrived as governor-general. He commanded the subsidiary force of the nizam, when the reduction of the Mysore was decided upon, and his division defeated Tippoo Sultan's right flank at Mallavelly. At the assault and capture of Seringapatam, he commanded the reserve in the trenches. He was appointed to the command in Mysore, and took the field (1800) against Dhoondiah Waugh, a Mahratta freebooter, who was defeated and slain. He was named second in command of the expedition which sailed from India to assist the English army in Egypt, but was prevented from embarking by illness. It was in the Mahratta war of 1803 that the young general won his first fame. After besieging and capturing Ahmednuggur, Wellington, with only 4,500 men, came upon the combined Mahratta forces, 40,000 or 50,000 strong, and not waiting for a larger British force that was on its way, won the brilliant victory of Assaye (q.v.). The victory of Argaum followed, and the great fort of Gawulghur, supposed to be impregnable, having been taken in December, the Mahratta chiefs sued for peace, after one of the most extraordinary campaigns on record. Wellington was made K.C.B. and received the thanks of the king and parliament. In 1805 he returned to England, and in November commanded a brigade in lord Cathcart's expedition to Hanover. In 1806 he obtained a seat in the house of commons for Newport, Isle of Wight, and in April, 1807, was appointed chief-secretary to Ireland, the duke of Richmond being lord-lieutenant. He held a command in the army under lord Cathcart in the expedition against Copenhagen in 1807, and after the affair at Kioge, negotiated the capitulation of Copenhagen. He received the thanks of the house of commons in his place, and returned to Ireland. In 1808 he commanded an expedition which sailed from Cork, being the first division of the British army sent out to assist in the expulsion of the French from Spain and Portugal. He landed at Corunna, and offered his aid to the army and people of Galicia; but the offer being declined, he finally landed (Aug., 1808) with 10,000 troops at the mouth of the river Mondego, in Portugal. The whole of the n. of Portugal was then in arms against the French. The affairs of Obidos and Rolica were quickly followed by the battle of Vimieira, in which he defeated Junot, who lost 3,000 men and 13 pieces of cannon. After this event Wellington signed the armistice which led to the convention of Cintra (q.v.). He subsequently gave evidence generally in favor of this convention at the court of inquiry (Nov. 22). Being superseded in the command of the army by men who were only his superiors in military rank and seniority, he returned to England. For the battle of Vimieira, he again in his place, received the thanks of the house of commons. On the death of sir John Moore he returned to re-assume the command of the Peninsular army, previous to which he resigned the office of chief-secretary of Ireland. He arrived at Lisbon and assumed the command April 22, 1809. He had now to contend with Soult and Victor, who had entered Portugal at the head of a veteran army, and were in possession of its finest northern provinces. Oporto had been taken by Soult, and Wellington was anxious to bring him to action at once, in order that he might not make his retreat unharmed. The passage, at Villa Nova, of the Douro, a wide, deep, and rapid river, in the face of a formidable enemy, who had removed every boat and barge to the opposite side of the river, was one of the boldest and most successful operations of the war. Wellington entered Oporto the same day, and followed the French army. He was now, by a decree of the prince-regent of Portugal, marshal-gen. of the Portuguese army. The French had fallen back to a point where re-enforcements were to meet them; and on July 27 and 28, 1809, the enemy, commanded by Victor and Sebastiani, were defeated by the British under Wellington at Talavera. The slaughter on both sides was terrible in this desperate, almost hand-to-hand, conflict. Wellington was unable to follow up his victory owing to the non-co-operation of the Spanish army under Cuesta and the want of supplies, and the junction of Soult, Ney, and Mortier in his rear, compelled him to fall back upon Badajoz. The thanks of parliament were voted for the victory of Talavera, and sir Arthur Wellesley was created (Sept. 4, 1809) a peer by the

titles of Baron Douro of Wellesley and Viscount Wellington of Talavera, with a pension of £2,000. In May, 1810, the French collected under Massena in such superior force in his front that he fell back upon Busaco, where he made a stand. Here the French (Sept. 27) made two attacks upon his position, but were repulsed with great slaughter. After this he retreated to Torres-Vedras (q.v.), to the occupation of which line of defense and his judicious method of maintaining it, the ultimate success of the Peninsular war may be chiefly attributed. Massena, being unable to find subsistence for his army, began his retreat to Santarem, followed by Wellington, who pursued the French in their retreat along the line of the Mondego. In April, 1811, he received the thanks of parliament for the liberation of Portugal. Spain, however, was now subdued by the French. The Spanish armies were annihilated, and it was of the last importance that Wellington should be able to keep his rear open to the Tagus. Wellington, having invested Almeida, Massena attempted to relieve it, but was skillfully repulsed at Fuentes de Onoro, May 3 and 5. The fall of Almeida followed, and Wellington ordered Badajoz to be invested. At this time he had great reason to complain of the want of support and re-enforcements from England. He had only the force which had followed Massena from Torres-Vedras, diminished by 9,000 men, *hors de combat*, in so many sanguinary encounters. Writing to Marshal Beresford, he said: "I inclose a dispatch from lord Liverpool [then at the head of the home government]; I believe they have all gone mad." The siege was carried on with vigor; but learning that Soult and Marmont designed to join their armies into one, in order to relieve Badajoz, and his own inadequate force not justifying him in risking a battle, he raised the siege and retired to the frontiers of Portugal. He next laid siege to the strong fortress of Ciudad Rodrigo; and on the night of Jan. 19, 1812, it it was carried by storm, and the garrison made prisoners. For this achievement he was created by the regency a grandee of Spain, with the title of duque de Ciudad Rodrigo. He again received the thanks of parliament and a further pension of £2,000 a year, and was advanced in the British peerage by the title earl of Wellington. He next marched toward Badajoz, invested it in March, and carried it by storm, April 6, after a frightful carnage; the allies losing nearly 5,000 men. In June he advanced to Salamanca, captured the convents there, which had been fortified by the French, and drove Marmont to the Douro. On July 22 he gained at Salamanca one of his greatest military triumphs. Marmont extended his line, with the view of turning Wellington's right: but the latter, perceiving that the enemy had thus weakened their left and center, vigorously assailed the weak points, and, after an obstinate resistance, put the whole army to rout. Ammunition, stores, 2 eagles, 11 pieces of cannon, and 7,000 prisoners were the trophies of victory. The loss of the allies was only about 700 killed and 4,000 wounded. Marmont lost an arm, and four French generals were killed. Wellington received the order of the golden fleece, entered Madrid, was made generalissimo of the Spanish armies, and was advanced in the British peerage by the title of marquis of Wellington. The thanks of parliament were again voted to him, together with the sum of £100,000, to be laid out in the purchase of lands to be settled on him, his heirs, and successors. In September he marched to Burgos, but, failing to capture it, he again retreated to the frontiers of Portugal. Wellington visited Cadiz and Lisbon, where he was received by the whole population. In May he marched his army into Spain in two columns, and on June 21 gained, at Victoria, another signal victory over the French, commanded by king Joseph, assisted by marshal Jourdan. The enemy lost 151 pieces of cannon and all their ammunition. The king's private carriage, letters, etc., fell into the hands of the victors. In exchange for the bâton of Jourdan, which was found on the field, the prince regent forwarded to Wellington the bâton of a field-marshal of England. By this splendid and important series of victories he had reached the summit of martial glory. The deliverance of Spain from the French was now certain. His infantry were soldiers who would, in his own words, "go anywhere and do anything;" and even the invasion of France itself seemed to his countrymen to be no longer chimerical. He pursued the French army to France by Pamplona. He failed, July 25, to carry San Sebastian by assault, but gained another decisive battle over Soult at the Pyrenees, and the French army retreated into France. A second attempt to carry San Sebastian by assault was successful, but it cost Wellington 2,300 in killed and wounded. He now crossed the Bidassoa, and invaded France. Pamplona surrendered. After the passage and battle of the Nivelle, and the passage of the Nive, the victorious army of Wellington was attacked, Dec. 10 to 18, on the left and right, by Soult, who was defeated. Leaving two divisions to blockade Bayonne, Wellington followed Soult with the rest of the army. On Feb. 27, 1814, he defeated Soult at Orthes, and crossed the Adour. The affairs of Aire and Tarbes were followed by the passage of the Garonne; and, on April 10, Wellington consummated this series of brilliant victories by again defeating Soult under the walls of Toulouse. The allied Russian and German armies having entered Paris, and Napoleon having signed his abdication a few days before, this last battle would not have been fought, but for the non-arrival of news of the events of Paris. In a few weeks Wellington was in Paris, presenting the trophies of his brilliant campaign to the allied monarchs. He was created, May 3, Marquis of Douro, and Duke of Wellington in the British peerage, and received an additional grant of £400,000. He received for the twelfth time the thanks of parliament for his services, and on his arrival in England was greeted with the utmost enthusiasm. On June 28 he took his seat for the first time

in the house of lords. He next returned thanks at the bar of the house of commons, and was addressed by the speaker. He was appointed ambassador-extraordinary to the court of France in July, 1814, whence he proceeded to the congress of Vienna. Napoleon having escaped from Elba, the congress was abruptly broken up. Wellington was appointed commander of the British forces on the continent of Europe, and from Vienna joined the army at Brussels. It appeared probable that Napoleon would make a bold advance into Belgium, and its defense was assigned to an Anglo-allied army under Wellington, and a Prussian army under Blücher. The battles of Ligny (q.v.) and Quatre Bras (q.v.) were succeeded on June 18, 1815, by the great battle of Waterloo (q.v.). Here the grand and decisive blow was struck; here for the first and last time the emperor and the great English general met and measured swords, and here the power of Napoleon was finally crushed. The allied armies, under Wellington and Blücher, marched upon Paris; the French army evacuated Paris under a convention; and Louis XVIII. entered Paris the very day after the English army. Marshal Ney was brought to trial. He relied upon the terms of the capitulation of Paris, and appealed in vain to Wellington, who denied that the French king was bound by the convention—a reading which it is impossible to justify, as sir A. Alison has shown in his *History of Europe*. At the request of the allied sovereigns Wellington took the command of the army of occupation, and resided in Paris from 1815 to 1818. Two attempts were, during this period, made upon his life: gunpowder was placed in his cellar for explosion; and one Cantillon discharged a pistol into his carriage; for which attempt at assassination Napoleon I. left the miscreant a bequest in his will. When the allied armies evacuated France in 1818 the emperors of Russia and Austria, and the king of Prussia, created Wellington a field-marshal of their armies. He was created prince of Waterloo by the king of the Netherlands. The gratitude of the British nation was, meanwhile, enthusiastically manifested. Statues were raised to his honor in the metropolis. Parliament voted £200,000 in addition to former grants; and the mansion and estate of Strathfieldsaye were purchased, to be held by Wellington and his heirs. The office of master-general of the ordnance, now abolished, but then comprehending the control of the artillery branch of the service, was conferred upon him. At the coronation of George IV., in 1821, he officiated as lord high constable of England. In October he attended George IV. to the field of Waterloo. In 1822 he represented Great Britain at the congress of Verona, where he ineffectually exerted his influence to prevent the invasion of Spain by a French army, in support of absolutist principles. In 1826 he went on a special embassy to St. Petersburg, when he induced the emperor Nicholas to act in common with England and other powers, as mediators in the quarrel between Turkey and Greece. On his return he was appointed constable of the tower. In 1827 he succeeded the duke of York as commander-in-chief of the army, and was made col. of the Grenadier Guards.

From this period his political career may be said to begin. When Mr. Canning received the commands of George IV. to form an administration, Wellington, with six other members of the Liverpool administration (including lord Eldon and Peel), resigned office. In the explanation which he gave, he emphatically denied that he had entertained the ambition of himself filling the post of first-minister; and said he felt his incapacity for such an office so strongly that he should have been "mad" if he had coveted it. In Aug., 1827, after Mr. Canning's death, he again accepted the command of the army, which he resigned on being called upon by George IV. (Jan. 8, 1828), to form an administration. Of strong tory politics, he was, nevertheless, the first minister to cede to the growing popular power. The test and corporation acts were repealed, and the removal of the Catholic disabilities was the first measure proposed by Wellington in the following session, upon the ground of the formidable attitude of the people of Ireland and the danger of civil war. This measure involved him in a bloodless duel with the earl of Winchelsea. The French revolution of 1830 appears to have influenced him in making a firm stand against reform in parliament, in the same proportion that it raised the demands of the people; and when the struggle of continental Europe to emancipate itself from arbitrary government strengthened the popular cry for "parliamentary reform," he chose the earliest moment to declare the unalterable perfection of the representative system of the country, and the determination of his government to resist all measures of parliamentary reform. His unpopularity became excessive; and, anticipating a defeat in the house of commons, on Mr. Brougham's proposition for reform in parliament, Wellington resigned office, and was succeeded by earl Grey. He had meanwhile become lord-warden of the Cinque Ports. Under the administration of earl Grey, Wellington held no office. He strenuously opposed the reform bill, and a London mob broke the windows of Apsley House, and hooted and pelted him in the streets. In Jan., 1834, he was elected chancellor of the university of Oxford. Upon the enforced resignation of lord Melbourne, in Nov., 1834, he was sent for by William IV. He declined to take the premiership, and was intrusted by the king with the whole charge of the government, and the seals of the three secretaries of state, until sir R. Peel could arrive from Rome. Peel constructed a conservative government, in which Wellington took the office of foreign secretary. In April Peel resigned, and henceforward Wellington ceased to take a prominent share in the civil government of the country. He gave a generous welcome to Soult, who represented France at the coronation of queen Victoria, and was received with great cordiality by the people on this occasion. In Aug., 1839, a grand

banquet was given to him at Dover, as lord-warden of the Cinque ports, on which occasion lord Brougham proposed his health in a brilliant eulogium. In 1841 he accepted a seat in the cabinet of sir R. Peel without office. In 1842 the queen visited him at Walmer castle, and in the same year he was re-appointed to the command of the forces. In 1845 he doubted the policy of repealing the corn laws; but in conformity with his usual practice of considering "how the queen's government was to be carried on," he determined to stand by sir R. Peel in his attempt to abolish them. Wellington not merely consented to remain in the cabinet, but accepted the higher office of president of the council in lieu of the post of lord privy seal. When the bill came up to the lords, Wellington, with great emotion and earnestness, warned the peers not to reject the bill, and never to separate themselves from both the crown and the house of commons. His speech made a great impression, and the bill passed a second reading by a considerable majority. He retired with the Peel government in July, 1846. After this event, he may be said to have withdrawn from political strife, nor is it to be denied that his share in the repeal of the corn laws cast a halo of popularity around the remainder of his life. In 1848 he called attention to the unsatisfactory state of the national defenses in a letter to sir J. Burgoyne. As commander-in-chief he directed great preparations to be made to prevent a Chartist outbreak on the 10th of April. His last speech in the house of lords was delivered in support of the militia bill, when he declared that England had been carrying on war in all parts of the world with an insufficient peace establishment. On Sept. 14, 1852, he was seized at Walmer castle with an epileptic fit, became speechless, and died the same afternoon. His remains were honored by a public funeral. The body, after lying in state at Chelsea hospital, was removed to the Horse Guards; and, on the morning of Nov. 18, was borne through the streets of London to St. Paul's cathedral where it rests by the side of that of lord Nelson. The funeral pageant was witnessed by a countless multitude. His *Dispatches*, published by Col. Gurwood, in 12 vols., are the proudest monument of his glory; they exhibit him as a commander who overcame countless difficulties by honesty, sagacity, singleness and constancy of purpose, and devotion to duty. Throughout his long career he appears the same honorable and upright man, devoted to the service of his sovereign and country, and just and considerate to all those who served under him. As a general he was cautious, prudent, and careful of the lives of his men; but when safety lay in daring, as at the battle of Assaye (q.v.), he could be daring in the extreme. He enjoyed an iron constitution, and was not more remarkable for his personal intrepidity than for his moral courage. The union of these qualities obtained for him the appellation of the "iron duke," by which he was affectionately known in his later years. His parliamentary oratory was plain, and to the point. He spoke without fluency or art, yet his strong sense and practical sagacious judgment gave him great weight with his brother-peers. His tastes were aristocratic; and his aids-de-camp and favorite generals were almost all men of family and high connections. Altogether, he was the very type and model of an Englishman; and in the general order issued by the queen to the army he was characterized as "the greatest commander whom England ever saw." He married, in 1806, the second daughter of the third earl of Longford, and by her (who died in 1831) he left two sons—Arthur Richard, the second duke (who also inherited the earldom of Mornington), and Charles, deceased, whose son—Henry Wellesley—is now the possessor of the title.

Col. Gurwood's *Dispatches of the Duke of Wellington*, 12 vols.; Gurwood's *General Orders of Duke of Wellington*, 1809–18; Napier's *History of the Peninsular War;* Alison's *History of Europe;* Thibaudeau, *Histoire de l'Empire;* Thiers, *Histoire de l'Empire;* marquis of Londonderry's *Narrative of the Peninsular War*, 1808–13; Gleig's *Life of Arthur, Duke of Wellington;* Bourrienne's *Mémoirs sur Napoleon;* Las Casas, *Mémorial de Ste-Hélène; La Vie de Wellington*, by Brialmont; *Speeches in Parliament of Duke of Wellington; Sir R. Peel's Memoirs*, by his literary trustees; *Supplementary Dispatches and Memoranda of Field-marshal Arthur, Duke of Wellington*, edited by his son, the duke of Wellington, in 14 volumes, 1858–75; also, in continuation of the above, *Dispatches, Correspondence, and Memoranda of Field-marshal Arthur, Duke of Wellington*, in eight volumes, 1867–80. A recent sketch of Wellington is that of General Lord Roberts, *The Rise of Wellington* (1895).

WELLINGTO'NIA, a genus of trees, of the natural order *coniferæ*, of which only one species is known, *W. gigantea*, the greatest of all pines, and indeed by far the largest tree of temperate climates. The genus is nearly allied to *sequoia* and *taxodium*. The foliage is very similar to that of an arbor vitæ, the leaves being very small, like scales, and closely appressed to small slender branchlets. The leaves of young plants are longer and somewhat needle-shaped. The branches divide into very numerous small branchlets. The flowers are generally solitary and terminal, the male and female flowers distinct but on the same tree. The cones of the *W. gigantea* are ovate, from 1½ to 2 inches long, by 1½ inches broad, single, or in opposite pairs, rarely clustered, the scales wedge-shaped, with about four seeds under each. The *W. gigantea* has a columnar stem, with branches only on the upper half of it, the branches of comparatively small size, and not forming an umbrageous head. The stem attains a height of 300 ft., and sometimes more, perfectly straight and erect. One tree is known, 321 ft. in height; and near it lies a larger one, which has fallen, and which was broken against another large tree in its

fall, its diameter where it was broken, 300 ft. from its base, being 18 feet. Another tree is 102 ft. in circumference at the base. The W. is found only in a limited district in California, on the Sierra Nevada, at an elevation of 4,000 to 5,000 feet above the sea. It was discovered in 1850 by Mr. Dowd, who, being engaged in deer hunting, came with astonishment into the midst of a group of these trees, now known as the mammoth trees of Calaveras. In this locality, within an area of 50 acres, are 123 large trees, 20 of which exceed 25 ft. in diameter at the base, and are therefore about 78 ft. in circumference. A tree which was felled was 302 ft. in height, and 96 ft. in circumference at the ground. It was sound to the center. Its age may be guessed at something like 3,000 years. It was calculated to contain about 500,000 cubic feet of timber.

WELLS, a co. in n. e. Indiana, drained by the Wabash river; 357 sq.m.; pop. '90, 21,514. Co. seat, Bluffton.

WELLS, an ancient city and municipal and parliamentary borough, in the county of Somerset, pleasantly situated at the foot of the Mendip hills, 15 m. s.w. of Bath. It is a clean and cheerful town, with runlets of water flowing through each principal street. The cathedral, a remarkably beautiful edifice, dating from the first half of the 13th c., is for the most part in early English; but its west front, one of the noblest façades in the kingdom, and which is enriched with 300 statues, is in Gothic. The bishop's palace, originally founded in 1088, is surrounded by a moat supplied from the abundant source of St. Andrew's well—from which the town is said to derive its name—and by lofty walls. There are no manufactures, and the trade is chiefly retail. Pop. '91, 4822.

WELLS, Charles, b. England, about 1798. His name is mentioned by Keats in one of his sonnets as that of an intimate friend. Under the name of "H. L. Howard," Wells published a volume called *Stories after Nature* (prose) in 1822, and in 1824, *Joseph and his Brethren, a Scriptural Drama.* These met with no success, and he abandoned the profession of literature. Within the last twenty years, however, the drama has been extravagantly praised by critics of the Swinburnian school. In 1876 the poem was republished with a critical introduction by Mr. Swinburne.

WELLS, David Ames, d.c.l., b. Mass., 1828; graduated at Williams college, 1847, and at the Lawrence scientific school, 1857. Mr. Wells has devoted much study to questions of political economy and government; was commissioned by the U. S. government to inquire into and publish reports on questions of taxation and revenue, 1865–70; has delivered courses of lectures on political science at Yale college; and has published pamphlets in favor of free trade and on other economical subjects. In 1876 he was a candidate for congress on the democratic ticket, but was defeated. His degree of d.c.l. was received from Oxford university. He is a leading advocate of free trade.

WELLS, Horace, 1815–48; b. Vt.; studied dentistry in Boston, and practiced it for a time there till 1836, when he removed to Hartford, Conn. He had already conceived the idea that some anæsthetic might be used in dentistry to prevent pain. He had thought of the employment of nitrous oxide gas for that purpose as early as 1840. Four years later G. Q. Colton lectured in Hartford, and gave nitrous oxide gas to several persons, who were rendered unconscious of pain. The next day Wells had a tooth extracted without pain under the influence of the gas, and he used it successfully in several cases the same year, and it was used by other dentists in Hartford. Early in 1845 he communicated his discovery to Drs. Hayward, Warren, W. T. G. Morton, C. T. Jackson, and others in Boston, and extracted a tooth from a patient to whom the gas had been given before the Harvard medical school. In 1846 Dr. Morton obtained a patent for anæsthetics against the remonstrance of Wells. After a visit to Paris, where he communicated his discovery to the French medical societies, and on his return to America, he published *A History of the Discovery of the Application of Nitrous Oxide Gas, etc.* (1847). The dispute as to his discovery and constant experiments upon himself with chloroform, produced mental alienation. He was arrested in New York, accused of throwing vitriol on the clothes of women in the street, and he committed suicide.

WELLS, Samuel Roberts, 1820–75; b. Conn.; in 1844 admitted as a partner into the publishing-house of O. S. & L. N. Fowler. He was an enthusiastic phrenologist; lectured much on phrenology, in this country and Great Britain: was editor of the *Water-Cure Journal*, 1850–62, and of the *Phrenological Journal* from 1863 till his death. Among his works are *New Physiognomy*, and *How to Read Character*.

WELL-STAIRCASE, a winding staircase with an aperture left in the center, called the *well*, by which light and air are admitted.

WELSER, the name of a famous extinct patrician family in Augsburg. Julius Welser was knighted by the emperor Otto I. for his services in the war against the Hungarians. His son, Octavian Welser, settled in Augsburg, and from him descended the patrician family, which always held important posts in the council of that town. Bartholomew Welser, privy councilor of the emperor Charles V, was so wealthy that he could vie with the Fuggers (q.v.) in munificence. With the emperor's permission, in 1526, he fitted out three ships in Spain, which, under the command of Ambrose Dalfinger of Ulm, sailed for America, and took possession of the province of Caracas.

which the emperor gave Welser in pledge. Twenty years after this, the Welsers gave up their possession voluntarily, and it reverted to Spain.—The most famous of the family was the niece of Bartholomew Welser, PHILIPPINE WELSER, a daughter of his brother, Franz Welser, born about 1530. She had received an excellent education from her clever mother, and was exceedingly beautiful. On the occasion of a diet of the empire at Augsburg in 1547, she was seen by the archduke Ferdinand, the second son of the subsequent emperor, Ferdinand I., who fell in love with her. The young girl firmly rejected all the advances of this fiery youth of 19, and refused to have any relation with him excepting by marriage. They were therefore married in 1550, without the knowledge of his father, or of his uncle, Charles V. His father, on hearing the news, was exceedingly angry, and for a long time his son did not venture to appear before him. Even in other countries, this misalliance made a great noise. In the meanwhile, the loving couple enjoyed the greatest domestic happiness, and Philippine enchanted every one that knew her by her intelligence and kindness of heart. It was only after eight years that his father was reconciled. Philippine, in disguise, herself handed him a petition, and by her deportment on the occasion, as well as her beauty, disarmed the angry father. He forgave his son, declared his children legitimate, and raised their mother to be markgraven von Burgau. This happy marriage lasted 30 years. Philippine died at Innsbrück in 1580.

WELSH, HERBERT, b. Philadelphia, 1851; son of John, U. S. minister to Great Britain; and nephew of William: graduated at univ. of Penn., 1871; well known as an earnest advocate of the rights of Indians; author of numerous pamphlets and articles upon the Indian question. He visited the Sioux reservations, in 1882, and soon after published his convictions that the holding of land in severalty the education of Indian children, and the extension of law to the reservations, constituted the true solution of the problem. These views he eloquently upheld in lectures and addresses; and owing to his efforts the Indian Rights assoc. was established in Philadelphia, 1883, which society has had an important influence both upon public opinion and upon the Indian bureau at Washington. As the sec. of this assoc. Mr. W. was instrumental in securing the appropriation for the starving Piegans in Montana, in 1885, and the revocation of the executive order issued by Sec. Teller, throwing open to settlement the Crow creek and Old Winnebago reservations. His works are: *Four Weeks among some of the Sioux Tribes of Dakota and Nebraska in* 1882; *Report of a Visit to the Great Sioux Reserve in* 1883; *Report of a Visit to the Navajo, Pueblo, and Hualapais Indians of New Mexico and Arizona in* 1884.

WELSH, JOHN, b. Philadelphia, 1805. He was educated in Philadelphia, and became one of the prominent merchants of that city. He was elected pres. of the Centennial board of finance, 1873, and was re-elected at each subsequent meeting. His services were recognized by the subscription of $50,000 as a testimonial from his fellow-citizens, which was applied, at his request, to the establishment of the John Welsh professorship in the univ. of Penn. He was appointed minister to England, 1878, which position he filled for two years. He d. 1886.

WELSH, WILLIAM, 1810–78; b. Penn.; brother of John, who was minister to England, 1878–79; engaged in business in Philadelphia and acquired wealth. He filled many local positions of trust and honor, was a director of Girard college, and a member of the Indian peace commission of Grant's administration.

WELSH LANGUAGE AND LITERATURE. The Celtic languages are divided into two groups, Gaelic and Cymric. To the latter of these the Welsh belongs, and has even given name, as forming the most important member of the group, which comprises besides, Armorican (spoken in Bretagne) and Cornish (now extinct). A controversy has been waged concerning the nature and closeness of the intimacy existing between the Gaelic and Cymric tongues, but the question may now be considered settled by the researches of the Rev. Richard Garnett (*Gentleman's Magazine*, May, 1839), who found, on examining the monosyllabic words in the introductory part of Neilson's *Irish Grammar*, that out of 270, no fewer than 140 were identical in sense and origin with corresponding Welsh terms, that 40 were cognate, an equal number borrowed from Latin, Saxon, etc., and that only 50 were peculiar to the Gaelic. Nevertheless, it is not to be supposed that the affinity is as close as that which exists between English and so-called Scotch. It is rather (according to Mr. Garnett) such as exists between Icelandic and German. A Welshman cannot understand a Highlander or an Irishman; he cannot even understand a Breton (as used to be believed), though the language of the latter is undoubtedly Cymric. Most extraordinary hallucinations were formerly current in regard to the antiquity of the Cymric tongues. Pezron, the Breton investigator, gravely affirmed that Welsh and Armoric (which he considered the same) had been "the language of the Titans, that is, the language of Saturn, Jupiter, and the other principal gods of heathen antiquity." The Rev. Joseph Harris, editor of the *Seren Gomer*, remarked in 1814 that "it is supposed by some, and no one can disprove it, that Welsh was the language spoken by Adam and Eve in Paradise." The *fact*, on the other hand, is, that of the two branches of Celtic, the Cymric is less ancient than the Gaelic, and that among the Cymric tongues the Cornish is probably older than the Welsh. (See Norris, *Ancient Cornish Drama*, Oxford, 1859.) But preposterous as the views of most patriotic Welshmen are on this subject, it is undoubtedly true that the Welsh is one of the oldest living languages in Europe, and that it possesses a literature reaching back to

remoter times than that of any modern tongue except Irish. The most striking peculiarities of the language are the abundance of its grammatical permutations, and its facility in forming derivatives and compounds. Of the former, two examples may be given by way of illustration. The Welsh word for "father" is *tad;* for "my" *fy.* But you cannot say for "my father," *fy tad.* After *fy,* every word beginning with *t* must change the *t* to *nh;* and therefore the correct phrase is *fy nhad.* So after *ei, tad* becomes either *dad* or *thad,* according as *ei* means "his" or "her." The rules of permutation are almost endless, and, in the opinion of such Welsh scholars as are not Welshmen, useless, nothing being gained in point of euphony or expressiveness. The Welsh affirm that their language is exceedingly harmonious, and it would serve no good purpose to dispute the assertion; but foreigners ignorant of the tongue, and associating no definite ideas with the words that issue from a Welshman's lips, generally fail to realize the fact, and consider it in this respect—though not in others—distinctly inferior to Gaelic. The language, or rather the structure of sentences and the phraseology, exhibits a certain stateliness, or even grandiloquence, characteristic, indeed, of uncivilized nations. One thing specially deserves notice. The Welsh people are profoundly attached to, and familiar with it. It is not dying out, like Irish or Scotch Gaelic. It has a genuine literary, as well as oral existence even now, and though the changes it has undergone since the days of Taliesin are numerous and great—so great, indeed, that no modern unlettered Cambrian can understand a word of the early poetry of his country—yet it is essentially the same tongue that Cæsar and Agricola heard, and is consequently to be regarded with veneration as the solitary living link that unites those distant ages with our own.

There are extant, says Owen Pughe, some thirty old treatises on Welsh grammar and prosody. The most important of these is one composed by Geraint (880 A.D), revised by Einion (1200 A.D.), and regularly privileged by the sovereigns who then exercised authority in Wales. It was first printed by the Welsh MS. society in 1856, under the editorship of the Rev. J. Williams ab Ithel. Among English grammars of the Welsh language, the best is said to be that by the Rev. Thomas Rowland (2d ed., 1857); among dictionaries, that of Owen Pughe, entitled *Geiriddur Cymraeg a Saesoneg, a Welsh and English Dictionary* (2 vols. 1793; 3d ed. 1861, *et seq.*). It is, however, only a Welsh-English dictionary; the most satisfactory English-Welsh dictionary is that published by Daniel Silvan Evans (2 vols. Denbigh, 1852–1858).

The literature of Wales has been arranged into four periods: the *first* extending from the earliest times of the Norman conquest (1066 A.D.); the *second,* from the Norman conquest to the English reformation (*circa* 1536 A.D.); the *third,* from the English reformation to the beginning of the reign of George III. (1760 A.D.); and the *fourth,* from 1760 to the present day. To what date the oldest specimens of Welsh literature ought to be assigned, has been the subject of sharp dispute. These specimens are in verse and are rhymed. The chief of their alleged authors, with their supposed periods, are Aneurin (510–560 A.D.), Taliesin (520–570 A.D.), Llywarch *Hen,* or "the Old" (550–640 A.D.), and Myrddin or Merlin (530–600 A.D.). According to Pinkerton (see his preface to *Barbour*) and Laing (*Dissertation on Ossian*), they are not authentic; but the vindication of their authenticity, first by Sharon Turner in 1803, and afterward and more critically, by Mr. Stephens of Merthyr-Tydvil, in his *Literature of the Kymry* (1849), and Mr. Nash, in his *Taliesin, or the Bards and Druids of Britain* (1858), is considered conclusive. The last two of these writers, however, may almost be said to meet their opponents half way. Of the seventy-seven poems ascribed to Taliesin in the *Myvyrian Archæology of Wales* (a collection of all the most celebrated works in Welsh literature, 500–1400 A.D.), which appeared in 1801—under the auspices of Mr. Jones, Mr. Edward Williams (better known as "Edward of Glamorgan"), and Dr. Owen Pughe—Mr. Stephens considers fifty-seven to be demonstrably spurious, and only twelve to be probably genuine, that is, belonging to the age of Taliesin. Mr. Nash enables us to form an independent judgment on the point, for he translates some fifty of these poems; and we find that, instead of their exhibiting an antique Welsh character, they abound in allusions to mediæval theology, and frequently employ mediæval Latin terms. It is certainly unfortunate for the reputation of the "chief of the bards," that the specimens of his which *are* considered to be genuine possess exceedingly small poetic merit. The life of this famous but apparently over-rated genius is, of course, enveloped in legend. He is said to have been the son of a certain St. Henwg, and to have been educated at the college of St. Cadog. His life was spent successively at the courts of Urien Rheged, Gywddno, prince of Cardigan, and king Arthur, and his sepulcher is shown near Aberystwith. It is still called *Bedd Taliesin* (Taliesin's grave). Of the poems whose authorship is ascribed to Aneurin, a prince of the Cumbrian Britons, the most notable is that entitled *Gododin,* in which he pathetically laments a defeat of his countrymen by the Saxons. It is reckoned authentic. (Several English translations of the *Gododin* have been published, and a translation of the whole works of Aneurin was published by Mr. Probert in 1820). Llywarch Hen, also a Cumbrian warrior, is regarded as the finest and most poetical of all the semi-historical Welsh bards. Tradition reports that he lived to the age of 150. The burden of his verse is the miseries of old age, on which he descants with melancholy eloquence. (See *The Heroic Elegies and other Pieces of Llywarch Hen, Prince of the Cumbrian Britons,* with a literal translation by William Owen, 1792). The pieces ascribed to Merddyn, in the *Myvyrian*

Archæology, are in all probability spurious. Besides the names already mentioned, other poets of the first period are Gwyddno, Gwilym ab Don, Golyddan, etc.

The earliest specimen of Welsh prose now extant is the collection of the laws of king Hywel dda, or Howel the good (died 748 A.D.)—a work of great value in illustrating the manners and morals of early Welsh times, but it is very uncertain when or by whom the collection was made. The oldest extant MS. belongs to the 12th century. The latest and most critical edition (Welsh and English) is that published in 1841 by the record commission, and edited by Aneurin Owen, son of Dr. Owen Pughe. Another work, entitled *The Wisdom of Cadog the Wise* (a collection of proverbs pretending to be by a St. Cadog, who flourished in the 6th c., and was a friend of Taliesin), is of such doubtful authenticity that its claim can only be noticed in our sketch.

Second Period, 1066–1536.—A few years after the date of the Norman conquest, a new spirit was imported into Welsh poetry by the influence of Gruffydd ab Cynan, prince of North Wales, and Rhys ab Tewdwr, prince of South Wales, particularly of the former. Gruffydd had been born during his father's exile in Ireland, and was brought up in that country, where he appears to have acquired a familiarity with both the native Celtic literature and that of the Dano-Norse invaders. In the year 1100 he held a great Eisteddvod at Caerwys in North Wales, which was numerously attended by Irish bards and musicians. For the next 300 years, Wales is rich in native bards, a fact that conclusively refutes the tragic story of Edward I. having caused them all to be slain, lest their patriotic songs should stir the Welsh to renew the struggle for independence. Nearly 60 names occur in the *Myvyrian Archæology* between 1120 and 1380. The first is that of Meilyr (1120–60), whose best piece is entitled *The Death-bed of the Bard*. Meilyr's son, Gwalchmai ab Meilyr (1150–90), who is said to have accompanied Richard cœur de lion to Palestine, is a superior poet to his father. Fourteen of his productions are extant. Gwalchmai's son, Einion (1170–1220), also figures as a poet. Forty pieces are ascribed to Cynddelw (1150–1206), a contemporary of Gwalchmai, of which probably the most interesting is *The Death-bed of Cynddelw*. He has also some verses addressed to prince Madog or Madoc of Powys, whom enthusiastic Welshmen conceive to have discovered America before Columbus. Other bards of this second period are Llywarch ab Llewellyn (1160–1220); Hywel (1140–70), a brother of prince Madoc, and writer chiefly of erotic odes; Owain Cyveilioc (1150–97), also of princely rank, whose *Hirlas*, or the *Long Blue Horn*, is a great favorite with more than Welshmen; and above all, *Davydd ab Gwilym* (*circa* 1340–1400), who has been compared to Ovid, to Petrarch, and to Burns. In his verses, Welsh poetry undergoes a change—the bardic or Scaldic spirit disappears, and a more humane, if less patriotic spirit takes its place. Davydd sings of love and of social amusements; he was likewise a fierce satirist, though at times very penitent and pious; while, to complete his resemblance to the Scottish poet, and also to justify the biblical name he bore, he showed an unmistakable predilection for illicit love. Davydd's poems were first published in Welsh, with a biography of the author by Owen Jones and Owen Pughe (1789). An English translation of some of them by Mr. A. Johnes appeared in 1834. Besides the poets already mentioned, the following names are in high repute: Iolo Goch, the friend and bard of the famous Owen Glendower, who is said to have lived to the age of 120; Sion Cent ("John of Kent"), a name given him from Kent-church, in Hereford, where he resided (1380–1410), and who, having adopted the opinions of the Lollards, ultimately attained the reputation of a wizard; and Lewis Glyn Cothi, who flourished during the wars of the roses, and was bard to Jasper, earl of Pembroke, son of Owen Tudor and the widow of Henry V.

Prose.—The oldest Welsh chronicler of the second period is Caradoc, a monk of Llancarvan, who flourished in the first half of the 12th century. His work narrates in Welsh the history of his native country from the death of Cadwallader, 689, to the times of Caradoc himself. It is a dry, illiterate affair, like the Anglo-Saxon Chronicle. Contemporary with Caradoc was the famous Geoffrey of Monmouth (q.v.), bishop of St. Asaph, who died in 1154. He, however, though a Welshman, wrote in Latin, and belongs, therefore, rather to the general literature of England than to Welsh literature. His *Chronicle* commences with the fall of Troy, and ends with the death of Cadwallader, so that it forms an introduction to that of his friend Caradoc. In it the legend of Arthur first assumes that romantic and chivalrous form in which modern readers are familiar with it. It is impossible here to enter into a discussion of the question where the materials of the Arthurian romance were first accumulated; suffice it to say, that evidence preponderates in favor of their Welsh origin. To this *second* period must also be assigned that charming collection, the *Mabinogion*, or Children's Tales, of which a MS. volume of more than 700 pages is preserved in the library of Jesus college, Oxford, and is known as the *Red Book of Hergest*, from the name of the place where it was discovered. A beautiful edition of this work in Welsh and English, with preface and notes, was published in 3 vols. (1838–49) by lady Charlotte Guest. The age of these tales, which relate principally to Arthur and the Round Table, is doubtful. The transcription in the *Red Book of Hergest* belongs probably to the 15th c.; but the date of their composition may be safely held to be much earlier, perhaps somewhere in the 13th century.

The *Triads* may also be here noticed. They are collections of historical facts, maxims ethical and legal, mythological doctrines and traditions, and rules for the structure

of verse; all expressed with extreme brevity, and regularly disposed in groups of three. They were a very popular species of composition among the Welsh, and are of all ages. Examples occur in the poems of Llywarch Hen, but the greater part are found in transcripts and miscellanies of the 16th and 17th centuries. The "historical" triads are especially puzzling. They occur in a so-called collection, made by one Thomas Jones of Tregaron, about the close of the 16th century. This Jones was originally, it seems, an eminent robber—a Welsh "Rob Roy;" but in his later years he reformed, married an heiress, and became a justice-of-peace for the co. of Brecon. The peculiarity of his "collection" is, that it gives a totally different account of the origin of the Britons from Geoffrey of Monmouth, bringing them from a "summer land" (supposed to be Constantinople or the Crimea) over a sea called the "Hazy Sea." The question arises, and has not been settled: Whether are we to suppose Jones the fabricator of these "triads" or his account of the origin of the Britons the genuine record of an ancient tradition? In favor of the former hypothesis, unfortunately, is the circumstance that there is no trace of such an ancient tradition in the anterior literature of Wales.

Third Period (1536–1760).—This and the remaining period may be briefly sketched. The most notable fact in its commencement is the comparative ease with which the reformation made its way among the Celts of Wales. The Celts of the Highlands remained for a time, and those of Ireland remain to this day, obdurate adherents of the old faith; but those of Wales, on the whole, swiftly accepted the new religion. The art of printing had been in operation in England for more than half a century before it was applied to the Welsh language. The first book printed in the Welsh or any Celtic language was an almanac, with a translation of the Lord's prayer and the ten commandments (Lond. 1546). The author, William Salesbury, was a scholar and a zealous Protestant. In 1547 he published the first dictionary of English and Welsh, and executed the greater part of the first translation of the New Testament into his native tongue (Lond. 1567). In 1588 appeared the earliest translation of the whole Bible into Welsh. The author was a Dr. William Morgan, afterward bishop of St. Asaph's. A revised edition of this, in 1620, by Dr. Parry, Morgan's successor in the bishopric of St. Asaph's, is the translation still in use among the natives of the principality. Contemporary with Salesbury, but an adherent of the old faith, was Dr. Griffith Roberts, who lived on the continent, and published at Milan a Welsh grammar in 1567. Another contemporary was Dr. John David Rhys, whose principal work, *Cambrobrytannicæ Cymræcæve Linguæ Institutiones et Rudimenta*, is a treatise on Welsh grammar. The suspicious Thomas Jones of Tregaron, possible *author*, rather than collector of the "historical" triads, was a friend of Rhys, and died about 1620. In 1603 Capt. Myddleton, one of the first three persons who smoked tobacco in England, published a metrical version of the Psalms in Welsh, partly executed while cruising about in the West Indies. The most celebrated poets of the *third* period are the Rev. Rees Prichard, vicar of Llandovery (1579–1644), whose *Canwyll y Cymry* (Candle of the Cambrians) is a metrical version of his professional homilies or sermons, the eloquence of which had previously won for him a great reputation as a preacher; it is still popular, the 20th edition having appeared as late as 1858: Huw Morus, or Hugh Morris (1622–1709), author of a variety of pieces, which his countrymen consider unsurpassed in humor, pathos, and even sublimity—an edition in 2 vols. appeared at Wrexham (1823), under the title of *Eos Ceiriog* (the Nightingale of Ceiriog): and Goronwy Owen (1722—*circa* 1780), a gifted bard, but likewise an incurable drunkard, whose principal poems are contained in the first volume of a book entitled *Diddanwch Teuluaidd* (Domestic Amusement, Lond. 1763). Of the prose writers, the only noteworthy are Ellis Wynne (d. 1734), author of the *Bardd Cwsg* (Sleeping Bard, 1703), a series of visions of hell and Hades, written with great beauty of style; and the Rev. Moses Williams (1685–1742), an antiquarian scholar of high merit, whose *Repertorium Poeticum*, or list of Welsh poems and catalogue of Welsh books, is very valuable.

Fourth Period (1760 to present time).—Various causes co-operated to give a new impetus to Welsh literature after the accession of George III. Among these, the most powerful were the establishment of periodical publications, the institution of patriotic societies, and the spread of Methodism. The first important production of this period is entitled *Some Specimens of the Poetry of the Ancient Welsh Bards translated into English* (Lond. 1764), by Mr. Evans, curate of Llanvair Talyhaern, in Denbighshire. The next name deserving of mention is that of Owen Jones (1741–1814), who, though engaged in mercantile occupations all his life, managed, by his enthusiasm and liberality, to quicken and extend the public interest in Welsh literature. In 1771 he founded the *Gwyneddigion* (society of the "men of Gwynedd"), which gave prizes for the best performances on the Welsh harp, and the best Welsh poems. In 1801–1807, he caused to be published at his own expense, under the editorship of Owen Pughe and Edward Williams, three volumes of the *Myvyrian Archæology*, so called in honor of himself, who had assumed the bardic name of Myvyr, from his native vale in Denbigh. Owen Jones was, however, rather a Welsh Mæcenas than a Welsh *littérateur*. The next names of importance are those of the editors just mentioned—Owen Pughe and Edward Williams. The former (1759–1835), according to Southey, was a "muddy-minded man;" nor is the fact that he was a follower of Joanna Southcott, and one of her twenty-four elders, adverse to this description of his intellect. Be this as it may, Owen Pughe is the great Welsh lexicog-

rapher; his dictionary of Welsh (1793–1803) contains 100,000 words illustrated by 12,000 quotations. He also translated *Paradise Lost* into Welsh, in which work he threw off the chains of Welsh alliteration, an innovation generally acknowledged to be an improvement. Edward Williams (1745–1826), better known as Iolo Morganwg, is probably the finest Welsh genius of the fourth period. Southey knew him, and liked him greatly. His principal productions are *Salmau yr Eglwys yn yr Anialwch* (Psalms of the Church in the Desert); but an *Ode on the Mythology of the Ancient British Bards in the Manner of Taliesin* (1792), accompanied by notes and specimens of "triads," containing the metaphysical and religious doctrines of the old Druidical bards, provoked a long-protracted controversy. Morganwg said that he had copied them from a MS. collection of a Welsh poet, *anno* 1560, which was in his possession, and affirmed that the collection was of very great antiquity. He was often asked to produce it, but always declined; and Welsh critics of the stricter sort have now ceased to believe in its existence. The three associates in the publication of the *Myvyrian Archæology* had each one son, and all of these have become eminent in connection with the literature of their native country. Taliesin Williams (1787–1847), son of Edward Williams, wrote poetry both in Welsh and English; Aneurin Owen (1792–1851), son of Owen Pughe, among other works, published an important collection of the *Laws of Wales;* while Owen Jones, son of Owen Jones, the Welsh Mæcenas (died 1874), had a high reputation as on architect, the Alhambra at Sydenham being a favorable specimen of his professional talents. The fourth period of Welsh literature is naturally richer in critical than in creative works. Among Welsh antiquaries may be mentioned the Rev. Edward Davies (1756–1831), author of *Celtic Researches* (1804) and *Mythology of the Druids* (1809): the Rev. Thomas Price (1787–1848), author of the *Hanes Cymru a Chenedl y Cymry* (1836–1842), a history of Wales and of the Welsh nation from the earliest times to the death of Llewellyn; an admirable work, comprehensive, critical, and literary (Price was an ardent and voluminous writer, contributing to no fewer than 15 periodicals at the same time); and the Rev. John Williams ab Ithel, rector of Llanymowddwy in Merioneth, and editor of the *Cambrian Journal.* In 1856 he edited, for the Welsh MS. society, the *Grammar of Edeyrn, the Golden-tongued,* said to be composed about 1270; in 1860 the *Brut y Tywyrogion,* or chronicle of the princes: and in 1861 (*et seq.*), *The Traditionary Annals of the Cymry,* reprinted from the *Cambrian Journal.* Williams is a rather credulous and uncritical writer, but a scholar of undoubted merit. Probably the ablest recent Welsh scholar was the late Mr. Thomas Stephens of Merthyr-Tydvil, a man at once patriotic and honest, enthusiastic and critical. To him, above all others, Englishmen desirous of obtaining some clear and credible knowledge of Welsh literature, ought to apply. His principal works are *Studies on British Biography,* and *Literature of the Cymry in the Twelfth and following Centuries.* The enlightened views of Stephens have met with great acceptance among such English scholars as have paid attention to the subject of Welsh history and literature.

The poetry of the fourth period is not remarkable. The principal names are—David Richards of Dolgelly (1751–1827), author of a sort of epic on the Trinity—a very unsuitable subject for an epic—and a paraphrase of the history of Joseph: David Thomas of Caernarvon (1769–1822), who was very successful at the Eisteddfods: David Owen of Givion (1784–1841), whose poems were collected and published under the title of *Blodau Arfon* (Flowers of Arvon): the Rev. Daniel Evans, a collection of whose pieces was published at Llandovery in 1831, under the title of *Gwinllan y Bardd* (The Poet's Vineyard): the rev. Walter Davies (1761–1849), also great at Eisteddfods: the Rev. James Hughes (1779–1846): the Rev. William Rees of Liverpool, anthor of a spirited paraphrase of the Book of Job, etc.: and the Rev. William Williams of Caernarvon, author of *Grawn Awen* (The Treasure of the Muse), etc.

A good deal of indifferent Welsh prose has been written during this period on religious subjects, owing to the spread of Methodism among the Welsh, but it may profitably be overlooked by a foreigner; and with a glance at the history of Welsh periodicals and societies, we close our brief survey of the subject. The first Welsh periodical, edited by the Rev. P. Williams and Evan Thomas, appeared about 1770, and was entitled *Yr Eurgrawn Cymraeg* (The Welsh Treasure), but the first that attained any measure of success was the *Seren Gomer* (Star of Gomer), which was published at Swansea (1814). In 1831 *Y Drysorfa* (The Treasury) was commenced, under Calvinistic auspices: in 1836 *Y Diwygiwr* (The Reformer), and *Y Dysgedydd* (The Teacher); 1833–41, *Y Gwladgarwr* (The Patriot), more a literary than a theological magazine, and tolerably clever; *Yr Haul* (The Sun), a journal advocating the interests of the established church; and *Y Traethodydd* (The Essayist), commenced at Denbigh (1845), distinctly the best literary organ in Wales. In 1879 above 60 daily or weekly newspapers appeared in the principality; of these about a dozen were published in Welsh. There are also about the same number of monthly or weekly magazines or periodicals, helping to keep alive the ancient speech; and two quarterlies in the Welsh language, but on general subjects. There are besides Welsh magazines conducted in English. The *Cambrian Register*, the *Cambro-Briton*, the *Cambrian Quarterly Magazine*, and the *Cambrian Journal*, each of which appeared for a series of years, dealt almost exclusively with Welsh subjects. A Welsh Encyclopædia (*Encyclopædia Cambrensis—Y Gwyddoniadur Cymreig*) was begun under the editorship of the Rev. John Parry of Bala, in 1856. The *Archælogia Cambrensis*, the journal of the Cambrian archæological association, began to appear in 1846. The

Enwogion Cymru (1862) of the Rev. Robert Williams is a useful biographical dictionary of eminent Welshmen.

The leading Welsh societies, literary and antiquarian, that have existed, or still exist, are the Cymmrodorion, established in London in 1751, which lived for 30 years; the Gwyneddigion, also established in London in 1771, but extinct some 20 years ago; a second Cymmrodorion (1820–43); the society for the publication of ancient Welsh MSS. (founded at Abergavenny, 1837); and the Cambrian institute, founded in 1853. The Eisteddfod, the annual national "sitting" for the encouragement of bardism, music, and general literature, dates from the end of the 4th century. The meeting lasts three or four days, a president and conductor are appointed for each day, and it is attended by thousands of persons of all classes. Prizes and medals are given for the best poetical, musical, and prose compositions, for the best choral and solo singing, and singing with the harp. On the last day, the great event of "chairing" the fortunate bard takes place.

WELSH ONION, or CIBOL, *Allium fistulosum*, (see ALLIUM), a perennial plant, a native of Siberia. It has fistular leaves and no bulb. Its leaves appear very early in spring, and are then used in soups and salads. Its flavor more resembles that of garlic than of the onion. It has been long cultivated in kitchen-gardens in Britain, and perhaps deserves more attention than it receives, because it is ready for use before any similar plant in spring. The seed is sown in spring or summer; leaves fit for use are produced in the following spring, and the bed continues to be productive for a number of years. The name Welsh onion is from the German *Wälsch*, and merely indicates a foreign origin.

WELSH RABBIT (incorrectly supposed to stand for *Welsh rare-bit*), is an article of food borrowed, as the name indicates, from the Welsh. It consists of cheese, grated or cut in small bits, and toasted in a frying-pan. To this is added a small quantity of milk, and the whole is poured over slices of toasted bread. Ale is sometimes used instead of milk. The name is undoubtedly humorous in its origin, like "Cape Cod turkey" for a cod-fish.

WELWITSCHIA, a remarkable plant discovered by Dr. Welwitsch at Mossamedes, on the w. coast of Africa, in 1863, and named after him by Dr. J. D. Hooker, the celebrated English naturalist. Its reproductive organs place it among the *gnetaceæ*, a small family related to the conifers. It is never over a foot high, while its trunk may be 5 or 6 ft. in diameter. The seed-leaves, or cotyledons, which soon perish in most plants, continue to grow in Welwitschia, and are the only leaves it ever has, even if it lives for more than a century. All the growing parts of the plant are the very short, broad trunk, which rests upon a strong, tapering root, and the seed leaves abovementioned, which grow to be 6 ft. long, and from 2 to 3 ft. wide; green, very thick and leathery, and spreading out upon the ground; often torn and split by the winds. As the trunk increases each year in diameter, the leaves are left inserted in a circular groove, between the upper portion of which and the upper surface of the leaves, the flower-stalks spring. They are from 6 to 12 in. high, much branched, and bearing at the end of each branch a cone of scarlet scales, which overlap each other in four rows, each containing a flower. These cones grow to be about 2 in. long, and 1½ in. in diameter. This great natural curiosity grows upon a stony, sandy plateau, between 300 and 400 ft. above the level of the sea, in a region where there is seldom any rain. Sometimes the whole surface of the ground is almost covered with these plants, varying from a few inches in diameter to several feet. The plant is believed to live over 100 years.

WEN'CESLAS OR WENZEL, Emperor of Germany, 1361–1419; son of Charles IV., whom he succeeded in 1378. He at first was friendly to the cities, but afterward abandoned their cause. About 1390 he canceled all debts due to Jews upon payment to himself of from 15 to 30 per cent of the amount. In 1394 the Bohemian nobles organized a conspiracy, arrested him, and confined him at Prague; but he was released by the influence of the German princes. Having joined with France to demand the abdication of Popes Boniface IX. and Benedict XIII., and the election of a new pope, he was deposed by some of the German princes in 1400, and Rupert of the palatinate was chosen to succeed him. Soon afterward his brother Sigismund arrested him, and imprisoned him in Vienna; and in 1410 he resigned his rights as emperor to Sigismund. He showed some friendship for Huss.

WENDISH LANGUAGE, THE, is a Slavonic dialect, the sole survivor of the numerous dialects spoken by the Slavs who were overwhelmed by the Germans in the Middle Ages. As a sample of those dialects it is of great linguistic value. It may itself be subdivided into two dialects, Upper Wendish, resembling Czech or Bohemian, and Lower Wendish, resembling Polish. Phonetically Wendish is almost as rich as the Polish. It has three numbers in declension and conjugation, seven cases in declension, and a large number of tenses. It is fast becoming Germanized, and may in time disappear.

WENDS (from the same root as to *wend*, to *wander*, and signifying the wandering or roving border tribes), the name given by the Germans to a branch of the Slaves (q.v.) which, as early as the 6th c., occupied the n. and e. of Germany from the Elbe along the coast of the Baltic to the Vistula, and as far s. as Bohemia. They were divided into several tribes, which were successively subdued by the Germans, and either extirpated

or gradually Germanized and absorbed, although remnants of them are still here and there to be found. In a narrower sense, the name of Wends is given to those remnants of the Slavic population of Lusatia who still speak the Wendic tongue, and preserve their peculiar manners and customs. They number about 150,000. A collection of Wendic songs was published by Haupt and Smaler (2 vols., Grimma, 1843–44). The Wends, like the other subject Slavic tribes, were, in early times, cruelly oppressed by their German masters; in recent times their lot has been more tolerable.

WE'NER, LAKE, the largest lake in the Scandinavian peninsula, and after the lakes Ladoga and Onega in Russia, the largest in Europe, is situated 150 m. w.s.w. of Stockholm, and about 30 m. inland from the Cattegat. It is over 110 m. in length, and varies from 15 to 48 m. in breadth, is 309 ft. in greatest depth, and lies 150 ft. above sea-level. Area 2290 sq. miles. From the n. shore a peninsula extends southward into the middle of the lake; and from the southern shore a peninsula extends northward to within about 15 m. of the point of the northern peninsula; the portion of the lake lying to the w. of these peninsulas receives the name of Dalbo lake. Of the numerous rivers that feed the lake, the chief is the Klar, from the n., and its surplus waters are discharged into the Cattegat by the river Göta. It is connected by a canal with lake Wetter, by means of which the Göta canal, lake Roxen, etc., inland communication is established between the Cattegat and the Baltic sea. The lake is rich in fish; it is often visited by sudden gusts of wind, and is in many places too shallow for navigation.

WENLOCK, a parliamentary and municipal borough in the county of Salop, 12 m. s.e. of Shrewsbury. Pop. of parliamentary borough '91, 15,703. The principal buildings in Much Wenlock are the church, a building of considerable antiquity, bearing traces of Saxon and Norman architecture; and the town-hall, a venerable and interesting structure, decorated internally with elaborate oak carvings of the time of Charles II. There are also a savings-bank and a public library and reading-room. The extensive ruins of Wenlock abbey afford a rich treat to antiquaries. The abbey was founded in the year 680, and was the parent church of Paisley abbey, Scotland. The remains have been carefully preserved from further dilapidation by the owner, J. Milnes Gaskell, esq., formerly M.P. for the borough, who converted a portion of them into an occasional residence for himself. Wenlock is an ancient municipality, with separate quarter-sessions, and is the first borough that acquired the right by charter of representation in parliament.

WENLOCK GROUP, an important series of rocks of upper Silurian age, which are largely developed in the neighborhood of Wenlock. The group is divided into an upper and lower series. The upper, known as the Wenlock limestone, consists of a considerable thickness, sometimes reaching 300 ft. of a gray sub-crystalline limestone, so hard that it has withstood the weathering which has removed the softer shales above and below it. It forms a ridge parallel to that of the Aymestry limestone, running for 20 m. n.e. to s.w. through the south-eastern portion of Shropshire. Sometimes it contains huge concretionary masses of crystalline carbonate of lime, locally named "ball-stones;" in other places, it becomes thin and flaggy. It abounds in fossils, especially in corals, crinoids, mollusca, and trilobites. The lower Wenlock series consists of 1400 ft. of Wenlock shale, and 150 ft. of Woolhope limestone and grit. The Wenlock shale is generally a dark gray, almost black argillaceous rock, often containing elliptical concretions of impure earthy limestone. It is worked in some places for flagstones and slates. The Woolhope limestone and grit consists of gray argillaceous nodular limestones resting on fine shales. In Denbighshire it appears as a coarse grit, often of great thickness, and producing a very barren soil. The fossils of the lower Wenlock beds are of a similar character to those of the upper series.

WENS are encysted tumors, much more common on the scalp than in any other situation, though occasionally observed on the face, shoulders, etc., and consisting of obstructed sebaceous glands, which enlarge by the internal pressure of their accumulated secretions. The closed orifice may be often noticed in the form of a small dark point, and in that case the duct may sometimes be gradually enlarged by the gentle introduction of a probe or director, and its contents pressed out. By this treatment they may, at all events, be kept from being unsightly, and will sometimes shrivel up and disappear. If this treatment fail, and the patient finds the tumor so annoying that he insists upon its removal, it must be exterminated with caustic or the knife. In consequence of the well-known dangers (especially erysipelas) that frequently follow cutting operations of the scalp, the caustic treatment is generally preferable. The most prominent part of the wen must be thoroughly cauterized with nitric acid or potash, which will lead to the formation and separation of a slough, which will lay open the tumor, which may then be left to empty itself and wither, or may be emptied by pressure, and cauterized within. As a general rule, wens are better left alone, unless they can be emptied by simple pressure, as severe operations on them are frequently attended with danger.

WENTLETRAP, *Scalaria*, a genus of gasteropodous mollusks, of the family *turritellidæ*. The shell is spiral, with many whorls, the whorls deeply divided, and not always close together, crossed by remarkably elevated ribs, the aperture round and rather small. The animal is furnished with a proboscis, and has the eyes placed on an external convexity, the foot short and oval. About 100 species of this genus are known. Those which have the whorls close together are called false wentletraps by shell-collectors;

those in which they are not contiguous are known as true wentletraps. Of the former, some are found in northern seas, as *scalaria communis* on the coasts of Britain and of continental Europe, and *S. Grœnlandica* on those of North America. *S. Grœnlandica* is particularly abundant on the banks of Newfoundland, and forms part of the food of the cod. The *true* wentletraps are all natives of the seas of warm climates. Some of them are very beautiful. A species found in the s.e. of Asia, and known as the PRECIOUS WENTLETRAP (*S. pretiosa*), was once in such esteem among shell collectors that an extremely fine specimen is said to have been sold for 200 guineas; and an ordinary price was from three to five pounds. This shell may now be purchased for a few shillings. It is from 1½ in. to 2 in. long, snow-white, or pale flesh-colored, with eight separated—but not widely separated—whorls.

WENTWORTH, a co. in central Ontario, having lake Ontario for its e. boundary, drained by the head-waters of Welland river and other small streams; 489 sq.m.; pop. '91, 78,606. Co. seat, Hamilton.

WENTWORTH, BENNING, 1696–1770; b. N. H.; graduated at Harvard college in 1715. He engaged in mercantile pursuits and acquired an ample fortune. He was appointed a member of the council in 1734, was frequently a member of the assembly, and was royal gov. of New Hampshire, 1741–67. The town of Bennington, Vt., was named after him. He was a benefactor of Dartmouth college, to which he gave the site for its buildings. His grants of land in s. Vermont involved a long dispute with New York.

WENTWORTH, JOHN, 1719–81; b. N. H.; called to the bar; served in the colonial legislature, 1768–75, and was its speaker in 1771. He was active on the patriotic side during the revolutionary movement; was chairman of the correspondence committee; president of the convention of 1774, and a member of the council, 1776–81. He was judge of the Strafford co. (N. H.) court of common pleas, 1773–76, and of the supreme court, 1776–81.

WENTWORTH, Sir JOHN, LL.D., 1737–1820; b. N. H.; graduated at Harvard, 1755. In 1765 he was sent to England to present petitions from his native province, and in 1767 was made governor of New Hampshire and "surveyor of the king's woods in North America." As governor, he gave a charter to Dartmouth college, and endowed it with nearly 45,000 acres of land. The dislike of the revolutionary party became intense against Wentworth in 1774 on account of his assisting Gage in his fortifications, and he fled to England. After peace was declared he returned to Nova Scotia, and became, 1792, lieut.gov. of the province. His baronetcy was given him in 1795.

WENTWORTH, JOHN, JR., 1745–87; b. N. H.; son of John. He graduated at Harvard college in 1768, and at once began to take part in public affairs. He was a member of the committee of safety, and of the legislature during the revolution. He served in the continental congress, 1778–79; was a member of the council, 1780–84, and state senator from 1784 till his death.

WENTWORTH, JOHN, LL.D.; b. N. H., 1815; graduated at Dartmouth college, 1836, and was for many years editor of the Chicago *Democrat*. In 1843 he was elected to congress from the district which includes Chicago, and served six terms, leaving the old democratic party on the organization of the republican party. He was elected mayor of Chicago twice, and was a member of the Illinois constitutional convention of 1861. He d. 1888.

WENTWORTH, WILLIAM, about 1615–97; b. England. He was the first of the extensive family of that name in this country. In 1639, in company with Rev. John Wheelwright and others, he entered into an agreement for a settlement at Exeter, N. H., and afterward resided at Wells, Me., and at Dover, N. H. He was a ruling elder and preacher.

WERDAU, a t. of Saxony, on the river Pleisse, 40 m. s. of Leipsic. It has important industries, including manufactures of woolen fabrics, chemicals, machinery, playing-cards etc. Pop. '90, 16,259.

WERDEN, a t. of Rhenish Prussia, on the Ruhr, 17 m. n.e. of Düsseldorf. Pop. '80, 7,590, employed in the manufacture of cloth, linen, and silk, and alum and coal-mining.

WERDEN, REED, b. Penn., 1818; graduated at the Philadelphia naval academy, and became a midshipman, 1834. At the outbreak of the civil war he was a lieut., and in the Roanoke island and New Berne naval contests he commanded the *Stars and Stripes*, fighting his ship with great gallantry. In 1866 he was made capt.; in 1871, commodore; and in 1875, rear-admiral. He d. 1886.

WEREGILD (Ang.-Sax., *wer*, man; and *geld*, satisfaction), a composition by which, according to the custom of the Anglo-Saxons, Franks, and other Teutonic people, homicide and other heinous crimes against the person were expiated. There was an established progressive rate of weregild for homicide, varying at different times and among different Teutonic tribes, from the weregild of the *ceorl*, or peasant, to that of the king. In the time of Tacitus, the weregild for homicide among the Germans was due to the relatives of the deceased; that for other crimes one-half to the injured party, and one-half to the state. The sum paid to the relatives in case of homicide, also known as the *man-wyrth*, seems to have been looked on as the equivalent of the dead man's value.

As the power of the community or king increased, the exaction of retribution for the death of its members was considered to be the duty of the state as well as of the relatives, and the principle of division was applied to homicide as well as minor crimes; each payment being a separate full equivalent for the value of the deceased; the one to appease the feud, the other to make atonement to the state. This double weregild is recognized in the compensation for the death of a king by the laws of the Mercians and Northumbrians. In the days of Edward the elder the weregild had become a much more complicated penalty, the composition for homicide consisting of four different payments, two of which, the *fight-wite*, or penalty for a breach of the peace, and the *weregild*, went to the king as head of the state; while a sum called the *halsfang* was paid to the kindred to loosen the hand of the avenger of blood, and the *manbote* was given to the overlord to compensate him for the loss of a vassal. The graduated scales of weregild in use among the different Teutonic nations throw much light on the gradations of society at the period. It does not appear that among the nations who recognized the principle of weregild, the relatives were bound to accept a compensation for their kinsman's slaughter, in place of appeasing the death-feud by blood; the latter practice was often resorted to instead. It was only through the exertions of archbishop Theodore that Egfred, the Christian king of the Angles of Northumbria, adopted the alternative of accepting a weregild for his brother slain in battle by the Mercians, in place of demanding the blood of the slayer. A similar principle to that of weregild for homicide seems to have been recognized by the Celtic nations, and there are traces of it in the Mosaic code.

WERE-WOLF (Ang.-Sax. *wer*, a man), a man-wolf, a man who, either periodically or for a time, is transformed, or transforms himself into a wolf, becoming possessed of all the powers and appetites of a wolf in addition to his own, and being especially remarkable for his appetite for human flesh. The belief in the transformation of men into wolves or other beasts of prey has been very widely diffused; there is perhaps no people among whom some evidence of its former prevalence does not exist. It is not yet extinct, even in Europe. In many of the rural districts of France, the *loup-garou* (the latter part of the word is a corruption of the Teutonic *wer-wolf*) is still an object of dread. This superstition lingers too among the country-people of northern Europe, and a particular form of it flourishes vigorously among the Bulgarians, Slavonians, and Serbs, and even among the more intelligent inhabitants of Greece. See Vampire. Its details vary in different countries and districts. The definition given above includes only the commonest and the best marked of its incidents. Probably it has not yet entirely disappeared in any country whose rural districts are infested with wolves or other wild animals; and manifestations fitted to suggest it may be occasionally observed in the mad-houses of most countries. See Lycanthropia. The animal whose shape is taken, as already stated, is not always, though usually, a wolf; it was probably always the animal most formidable, or considered most inimical to man. In Abyssinia it is the hyena.

Occasional notices of lycanthropy, as it is called, are found in classical writers; and lycanthropy, as there described, was the change of a man or woman into a wolf, so as to enable the man or woman to gratify an appetite for human flesh, either by magical means, or through the judgment of the gods, as a punishment for some dire offense. Sometimes the transformation was into the shape of a dog or a bull. Ovid, in his *Metamorphoses*, tells the story of Lycaon, king of Arcadia, who, when entertaining Jupiter at a banquet, resolved to test his omniscience by serving up to him a hash of human flesh. The god, to punish him for this, transformed him into a wolf. Herodotus describes the Neuri as sorcerers who had the power of taking once a year, for several days, the shape of wolves; and the same account of them is given by Pomponius Mela. Pliny relates that, in Arcadia, every year, at the festival of Jupiter Lycæus, one of the family of Antæus was chosen by lot, and conducted to the brink of the Arcadian lake, into which, after having hung his garments upon a tree, he plunged, and was transformed into a wolf. Nine years after, if alive, he returned to his friends, looking nine years older than when he disappeared. Some notices of lycanthropy are to be found in Petronius; and allusion to it is also made by Virgil in the 8th *Eclogue*. Marcellus Sidetes tells us of men who, every winter, were seized with the notion that they were dogs or wolves, and lived precisely like these animals, spending the night in lone cemeteries. This disorder attacked men chiefly in the beginning of the year, and was usually at its height in February. It is worth while observing that the classical instances of lycanthropy mostly refer to Arcadia, a pastoral country, whose inhabitants suffered greatly from the ravages of wolves.

In Norway and Iceland, it used to be believed that there were men who were "not of one skin." Such men could take upon themselves other shapes than that of man, and the natures corresponding to the shapes which they assumed; they had the strength and other powers of the animal whose shape they bore, as well as their own. It was believed that the change of shape might be effected in one of three ways: simply by putting on a skin of the animal; by the soul of the man deserting the human body—leaving it for a time in a cataleptic state—and entering into a body borrowed or created for the purpose; or, without any actual change of form, by means of a charm, which made all beholders see the man under the shape of the animal whose part he was sustaining.

The two former were the common modes of transformation; at any rate, the sagas are full of illustrations of them; while illustrations of the third mode are comparatively rare. Nothing of the man remained unchanged except his eyes; by these only could he be recognized. Odin had, and freely exercised, the power of varying his shape. When men changed their shape to prey upon their kind, they always took the form of a wolf. It was believed that many had the power of thus transforming themselves; and great was the popular dread of were-wolves. Perhaps the best stories of were-wolves which are to be found are contained in the northern sagas. Scarcely anywhere did the belief in them go so deep into the minds of the people as among the northern races. In connection with it, notice may be taken of what is called the "Berserkr rage," which appears to have been a peculiar form of mania. The Berserkr yelped like dogs, or wolves rushing into conflict, bit their shields with their teeth, and committed terrible atrocities while the paroxysms of their disease were upon them. Berserkr has been rendered "bare-skinned;" others make it mean "wolf-skin-coated" (why not "bear-skin-coated?").

Olaus Magnus states that in Prussia, Lithuania, and Livonia, though wolves were very numerous and troublesome, the ravages of the were-wolves were regarded as much more serious. Every year at the feast of the nativity at night, the were-wolves assembled in great numbers at appointed places, and proceeded to look out for human beings, or tame animals, upon which they could glut their appetites. If they found an isolated house, they entered it, and devoured every human being and tame animal it contained; after which—showing that they were not common wolves—they drank up all the beer or mead. Similar testimony with regard to Livonia is given by bishop Majolus, who adds, that the transformation into the wolf-form continued for twelve days.

Instances of persons being changed into wolves by way of punishment, were freely believed in the middle ages; for example, St. Patrick was believed to have changed Vereticus, king of Wales, into a wolf; and there was an illustrious Irish family which had incurred the curse of St. Natalis, every member of which, male and female, according to the popular belief, had to take the shape of a wolf, and live the life of a wolf for seven years.

In the 15th and 16th centuries, the belief in were-wolves was, throughout the continent of Europe, as general as the belief in witches, which it had then come to resemble in many respects. It gave rise to prosecutions almost as frequent as those for witchcraft (q.v.), and these usually ended in the confession of the accused, and his death by hanging and burning. It was calculated to inspire even greater terror than witchcraft, since it was believed that the were-wolves delighted in human flesh, and were constantly lying in wait for solitary travelers, and carrying off and eating little children. The were-wolves, like the witches, were now regarded as servants of the devil, from whom they got the power—often exercised by anointing with a salve—of assuming the wolf's form; and it was believed that great numbers of them trooped together to the Devil's Sabbath. The stories of mutilations and other mishaps befalling them in the wolf-state, by which, when they resumed the human form, they were identified as were-wolves, exactly resemble the stories told of witches. In Sept., 1573, we find a court of parliament sitting at Dole, in Franche-Comté, authorizing the country-people to take their weapons, and beat the woods for a were-wolf, who had already—thus went the recital—"carried off several little children, so that they had not since been heard of, and done injury to some horsemen, who kept him off only with great difficulty and danger to their persons." Throughout Europe, the judicial cognizance of witchcraft and of lycanthropy ceased at the same time. In Great Britain, where wolves had early been exterminated, the were-wolf was only known by rumors coming from abroad; but the belief that witches could transform themselves into cats and hares, which did prevail, was precisely analogous to the belief in were-wolves, especially in its later forms.

The later forms of this strange belief were obviously sophisticated. In its earlier shape, three things are to be noticed—the power ascribed to the were-wolf of transforming himself, either by changing the shape of his own body, or projecting his spirit into another body; his appetite for human flesh; his taking the shape and nature of the animal held to be most malicious against man—the wolf. As to the first of these, all that can here be done is to point to its connection with the doctrine of transmigration (q.v.), and to add that it has been one of the commonest of human beliefs. As to the second, is it unlikely that in the early times in which the superstition had its origin, the appetite for human flesh may have been common enough to spread terror through whole districts? It is, at least, not improbable that every race of men has had an experience of cannibalism; and it may well have been that, in occasional cases, especially under conditions of disease, the taste for human flesh survived the general practice of using it. Modern Europe affords many unquestionable examples of this taste existing and being indulged in the midst of comparative civilization. There can be no doubt that some of the unhappy multitude put to death as were-wolves had really murdered and eaten the flesh of human beings. But secret murders, unaccompanied by cannabalism, would tend to support a popular belief in cannibalism. We have not to go out of our own age for proofs of the existence of men afflicted with a homicidal tendency: and in times when the means of detecting crimes were very imperfect, it is conceivable that the murders committed by one or two such persons would spread terror, and give support to a superstitious theory throughout a large district. The Maréchal de Retz, who lived

in the time of our Henry VI., had caused to be stolen and put to death by torture, under the most inhuman circumstances, many hundred children—he confessed on his trial that he murdered 120 in a single year. (A memoir of Gilles de Laval, Maréchal de Retz, has been compiled from authentic documents by P. J. Lacroix, the eminent French antiquary.) Perhaps no society has ever been free from men similarly constituted, and acting similarly according to their opportunities. As to the third point, if it be granted that a certain practice of, or general suspicion of cannibalism existed among a people who believed in the power of transformation, it is easy to understand how the cannibal, getting his victims by stealth, was supposed to indulge his inhuman appetite under the guise of the animal most unfriendly to man. And the existence of a form of mania in which the madman had the hallucination that he was changed into a wolf, yelled like a wolf, lived in many respects like a wolf, was calculated strongly to confirm the belief in men-wolves. In conjunction with the mischief done by real wolves, this itself may be thought almost enough to have given origin to the superstition. The hallucination of having undergone transformation into a wolf from time to time, seems to have been one of the commonest by which weak and crazed brains were possessed during the period when the hunt for were-wolves was kept up. The literature of this subject, though abundant, is for the most part fragmentary, and mixed up with other matters. A good account of the subject will be found in *The Book of Were-Wolves*, by Sabine Baring-Gould (Lond. 1865).

WERGELAND, Henrik Arnold, 1808–45; b. Norway; educated at Christiania university. He entered the ministry, but withdrew from it in 1834, the sentiments uttered in his poem called *Creation, Man and the Messiah* being thought inconsistent with his profession. He then studied medicine. In 1840 he was made keeper of the national archives. His dramatic and lyrical productions were long popular in Norway.

WERMLAND, a län in s.w. Sweden, adjoining Norway; drained by the Klar river; 7285 sq.m.; pop. '93, 250,935. It contains lake Wener, which has an area of some 2,000 sq.m., the third largest lake in Europe. Iron mines in this län are the richest in Sweden. The surface is mountainous. Capital, Carlstad.

WERNER, Abraham Gottlob, a celebrated mineralogist and geologist, b. at Wehrau, on the Queiss, in Upper Lusatia, Sept. 25, 1750. His father was director of a smelting-work, and he was thus led almost in childhood to the study of minerals. After some time spent at the mineralogical academy of Freyberg, he went to Leipsic, where he studied natural history and jurisprudence. Here, at the age of 24, he published his first work on mineralogy, a mere pamphlet on the external characters of minerals. In 1775 he was appointed professor of mineralogy, and curator of the mineralogical cabinet at Freyberg. In 1780 he published the first part of a translation of Cronstedt's *Mineralogy*, in his notes to which he gave the first outlines of the system which bears his name. In 1791 he published a *Theory of the Formation of Metallic Veins*, which was translated into English and French, and greatly extended his reputation. He was not, however, a voluminous author, but his views were diffused by his pupils, among whom were the most eminent German mineralogists of the time. In 1792 he was appointed councilor of mines in Saxony. He died at Dresden in 1817.

Werner's influence was very great in the promotion both of mineralogy and of geology. In his mineralogical system, minerals were distinguished and arranged chiefly according to their external characters; and mineralogists have now learned to depend much more than he did on their chemical constitution. In geology he did great service by arranging the facts already known, and guiding to proper methods of observation. His theory was extensively received for a time. It may be described as the opposite of the Huttonian theory, accounting for the present state of mineral substances in general by supposing them to have been dissolved or suspended in water; while the Huttonian theory ascribed almost everything to the action of fire. Werner's is sometimes called the Neptunian theory, while that of Hutton is styled the Plutonic. Modern geology recognizes a certain measure of truth in both, but rejects them alike in that character of completenesss or universality in which they were once advocated. Werner classified rocks into primary, transition, and secondary; and the terms are still sometimes used, although merely as convenient names.

WERNER, Friedrich Ludwig Zacharias, 1768–1823; b. Königsberg, Germany; studied law in that city, and in 1793 entered the Prussian civil service, holding office for twelve years in Warsaw and for two years in Berlin. In this time he produced four dramas, the most important being *Der 24ste Februar*, which shows a vivid imagination and considerable dramatic power. In 1809 he went to Rome, and two years later joined the Roman Catholic church. In 1814 he became a priest, preached in Vienna and elsewhere, making a great sensation by his peculiar eloquence. He remained in Vienna until his death. His collected works were published in 1841, and consist of eight dramas and many poems, hymns, and sermons.

WERNER, Karl, b. Germany, 1808; studied painting in Leipsic and Munich. He went to Rome in 1833, and resided there for the next 20 years. He afterward traveled through Spain, Scandinavia, and the east. Among his works are: "Venice in her

Zenith and Decline;" "The Lions' Court of the Alhambra;" and "Jerusalem and the Holy Land." His best work is in water-colors. He died 1894.

WERNIGERO'DE, a small walled t. of Prussia, in the government of Magdeburg, and 43 m. s.w. of the city of that name, stands at the northern base of the Brocken mountain. Its castle, the residence of the counts Stolzberg-Wernigerodé, comprises an extensive library and a zoölogical garden. It manufactures linen, cloth, and tobacco; and carries on copper-smelting and paper-making. Pop. abt. 9000.

WE'SEL, a strongly fortified t. of Prussia, on the Rhine, 32 m. n.n.w. of Düsseldorf. The Rhine, which here is joined by the Lippe, is divided by a fortified island, and crossed by a bridge of boats, protected on the left bank by a fort. Of its churches, the Willibrod Kirche was first opened in 1181. The industries include manufactures of soap, wire and cement. The citadel is defended by a considerable force. Pop. '90, inclusive of garrison, 20,724.

WE'SER (Lat. *Visurgis*), a river of Germany, formed out of the Werra, which rises in the Thuringer-wald, and the Fulda, rising in the Rhöngebirge, on the frontiers of Prussia and Bavaria. These streams, after a northern course, unite at Münden, in Hanover; and the united stream, the Weser, flows n. through Prussia, till, passing Bremen, it forms for about 40 m. the boundary between Oldenburg and Prussia, and enters the North sea by a wide but shallow estuary, much interrupted by sand. Entire length, 270 miles. It communicates with the Elbe by a navigable canal; but though considerably improved in this respect, the Weser is not of much use as a navigable stream. The principal trading town on its banks is Bremen.

WESLEY, JOHN, the founder of the Methodists (q. v.), was born at Epworth, in Lincolnshire, England, June 17, 1703. The family name was variously spelled Wesley and Westley, and is supposed to be the same with Wellesley, and to be derived from a place of that name near Wells. An Irish gentleman, Garret Wellesley, esq., of Dungannon, offered to make Charles Wesley, younger brother of John, his heir, on condition of his settling in Ireland, believing him to be of his own family. The offer was not accepted; and the estate of Mr. Wellesley went to another branch of the family, which was soon raised to the Irish peerage, with the title of earl of Mornington, and from which the duke of Wellington and the marquis of Wellesley sprung. The more immediate progenitors of John Wesley were ministers of the church of England, of Puritan principles. Some of them suffered for non-conformity. Bartholomew Wesley, the great-grandfather of John, was ejected from his living by the act of uniformity in 1662. John Wesley, the son of Bartholomew, was also deprived of his living, and was often fined, and several times imprisoned for preaching contrary to the law. Samuel Wesley, a son of this John Wesley, conformed to the church of England, but opposed the schemes of James II., refusing to be bribed by offers of preferment, which, on account of his erudition and talents, it was thought worth while to make to him. He supported the cause of the revolution, in circumstances of personal danger; and, in the beginning of the reign of William and Mary, was rewarded with the living of Epworth. He wrote an epic poem entitled *The Life of Christ*, and other similar works. He had a family of nineteen children. His wife Susannah Annesley, the daughter of an ejected minister, was a woman of remarkable intelligence and fervent piety, who devoted herself very much to the education, and particularly the religious education, of her children. His eldest son, Samuel, head-master of Tiverton school in Devonshire, was a tory and high-churchman, who strongly disapproved of the "new faith" and peculiar course of his brothers John and Charles. John Wesley was the second son of Samuel, or the second who grew up to manhood. In his infancy he had a narrow escape from being burned to death, when the parsonage of Epworth was burned by some of the parishioners in their rage against their pastor for his faithful reproving of their vices. Another remarkable story is connected with the parsonage of Epworth, and with the early years of John Wesley's life—the continued disturbance of the family throughout a considerable time, by loud knockings and other noises, which could not be accounted for, and which therefore were regarded as preternatural, although Mr. Wesley and his household were less affected by the strange visitation than perhaps its authors expected them to be, and persisted in residing in the parsonage, even making sport of "Old Jeffery," their unseen visitant, who "was plainly a Jacobite goblin, and seldom suffered Mr. Wesley to pray for the king and the prince of Wales without disturbing the family prayers."

John Wesley was a very diligent and successful student. The religious history of his college life belongs to the history of Methodism (see METHODISTS). After much conscientious hesitation as to his motives and fitness for entering the clerical profession, he was ordained deacon in 1725, and in 1726 he graduated as M.A., and was elected fellow of Lincoln college, Oxford. In the same year he was appointed Greek lecturer and moderator of the classes. He became curate to his father at Wroote, a small living which Samuel Wesley held along with that of Epworth, and while serving here, he was advanced to priest's orders in 1728. He returned to Oxford, and along with his younger brother, Charles, entered into those religious associations from which Methodism sprang. The intercourse of the brothers Wesley at this time with William Law, the author of the *Serious Call*, had a great influence on their opinions and conduct. They walked two or

three times a year from Oxford to visit Law at his house near London. In 1735, John Wesley was induced to go out to Georgia with general Oglethorpe, to preach to the Indians and colonists. His religious views at this time were strongly tinctured with asceticism. His intercourse with Moravians, who were his fellow passengers to America, and afterward his fellow-laborers in the colony, tended to stimulate his religious zeal. He attempted to establish a discipline in the colony, very different from that of the church of England at home, and failed in the attempt. The difficulties of his position were increased by an affair in which he became involved with the daughter of the chief magistrate of Savannah, whom he wished to marry; but on the advice of the Moravian bishop and elders, to whom he submitted the matter, he withdrew from her, and she very soon marrying another, Wesley refused her admission to the communion; upon which her husband raised an action at law, and Wesley, finding Savannah no suitable place for him, and, as he said, "shaking the dust off his feet," returned to England, having resided in America not quite two years. With religious zeal undiminished, he maintained an intimate connection with the Moravians in London. On May 24, 1738, some months after his return to England, he attended a meeting of a society in Aldersgate street, where, while one was reading Luther's Preface to the Epistle to the Romans, he experienced such a change of religious feeling that, notwithstanding all his previous zeal, he ever afterward regarded this as the time of his conversion. "I felt my heart strangely warmed," he says; "I felt I did trust in Christ, Christ alone, for salvation; and an assurance was given me, that he had taken away *my* sins, even *mine*, and saved me from the law of sin and death." Many who accept generally Wesley's views of conversion, doubt his opinion as to the date of his own. After this he visited the Moravian brethren at Herrnhut in Germany, made the acquaintance of Zinzendorf, and was introduced to the prince royal of Prussia, afterward Frederick the Great. Returning to England, he became associated with his old college companion, Whitefield, and after his example began, in 1739, the practice of open-air preaching. From this time, the history of Wesley's life becomes very much the history of Methodism. In 1740, he solemnly separated himself from the Moravians, finding that he differed from them in important points of doctrine; and in the same year the breach took place between Whitefield and him, which divided the Methodists into two sections, Calvanistic and Arminian. In the evangelistic work which he carried on in England, and in organizing the Methodist body, Wesley was indefatigable. He seldom traveled less than forty miles a day, usually on horseback, till near the close of his life, when he used a chaise. In 1752, he married a widow with four children, but the marriage proved an unhappy one, and a separation ensued. His health gradually declined during the last three years of his life, and after a short illness, he died in London, Mar. 2, 1791, in the 88th year of his age. His remains lay in state for several days in his chapel in the City road, dressed in the sacerdotal robes which he usually wore, with a Bible in his hand. Wesley was a voluminous writer. His writings are chiefly polemical and religious. His style in the pulpit was fluent, clear, and argumentative, not impassioned like Whitefield's; his countenance was mild and grave; and his manners agreeable, although he exercised a very imperial domination over the preachers of the Methodist body. He was a man of great benevolence, and gave away all his living to the poor. Probably no man ever exerted so great an influence on the religious condition of the people of England as John Wesley, and his influence has extended to the most remote parts of the world.—CHARLES WESLEY, his younger brother, b. at Epworth, Dec. 18, 1708, was associated with him in the whole Methodist movement. Having studied at Christ church, Oxford, and visited Georgia at the same time with his brother, he took an active part in the subsequent work in England. He was a clear and simple preacher, and a man of fervent piety, but of a disposition very far removed from asceticism. He is the author of a great number of hymns in use among the Methodists; some of which, however,, are among the best and most admired hymns in the English language, replete with pious feeling, and of lyrical power and sweetness almost unsurpassed. He died 1837. See *The Works of the Rev. John Wesley* (16 vols. Lond. 1809); *Life of the Rev. John Wesley, A.M.*, by Dr. Coke and Mr. Moore (Lond. 1792); *The Life of Wesley*, by Southey (2 vols. 1820; new ed. 1864); *The Life and Times of Wesley*, by Tyerman (1870); and *John Wesley and the Evangelical Reaction*, by Miss Wedgwood (1870).

WESLEY, or **WESTLEY**, SAMUEL, 1662–1735; b. England; was designed by his father, the Rev. John Westley, for the dissenting ministry, but early entered the church of England; studied at Oxford, supporting himself by teaching; was curate for a year in London, and the following year chaplain on board a man-of-war. He was subsequently curate for two years in London, and after the revolution was presented with the living of Epworth, Lincolnshire. He was the father of the renowned John Wesley, the founder of the denomination called Methodists. He published *The Life of Christ*, a heroic poem; *Elegies on Queen Mary and Archbishop Tillotson; History of the New Testament attempted in verse; History of the Old Testament;* a poem on the battle of Blenheim; a *Latin Commentary on the Book of Job;* a *Treatise on the Sacrament.*

WESLEYAN METHODIST CONNECTION OF AMERICA grew out of a separation from the M. E. church, the result of the connection of that church with slavery, and the arbitrary character of its government. The Revs. Orange Scott, J. Horton, and

Le Roy Sunderland withdrew in Nov., 1842, beginning at the same time the publication of a weekly paper, *The True Wesleyan*. In December following a number of other ministers also withdrew. Secessions of churches and ministers also took place in different northern states; the most extensive being in Michigan, where a conference was organized. A number of ministers and members also seceded from the Methodist Protestant church. The first local Wesleyan church was organized in Providence, R.I., in 1842.

In Feb., 1843, a convention of the seceders was held in Andover, Mass., where a basis of organization was partially agreed upon. This resulted in a call for a general convention, which was held in Utica, N. Y., commencing May 31, 1843. A form of church government was agreed upon, a "discipline" adopted, and about 3,000 members reported. The first general conference was held in Oct., 1844; the discipline was carefully revised, and the principles of the church clearly defined. About 6,000 members were reported. One great obstacle in the way of success at first was the want of church buildings. Societies were small, and generally far apart. They met with much opposition, but churches and parsonages were erected as fast as possible.

In 1866 several prominent ministers attempted to form a union with the Methodist Protestant church. But the discipline of the Wesleyans laid down certain principles of civil government, and required its members to vote in accordance with these principles—that the republic is a nation, that equal rights are to be accorded to all its citizens, and that all laws should conform to the Bible, the rule of practice for nations as well as individuals. The discipline also excluded from church-fellowship all members of secret societies. For the love of these principles the great body of the church refused to go into the union movement. The leaders, however, carried into the union a number of churches, with Adrian college in Michigan, and leaving the Book Concern at Syracuse, N. Y., practically bankrupt. The denomination seemed on the verge of extinction; but under the efforts of the Rev. Adam Crooks, who was appointed publishing agent and editor, the claims against the Book Concern were paid off in a few years. He also raised by subscription some $25,000 toward the erection of a new publishing house. In 1874, in the midst of his arduous labors, he was suddenly removed by death. Rev. D. S. Kinney was appointed his successor, and has been equally successful. He has raised additional funds, and in 1879 completed the new publishing house at Syracuse, a fine four-story brick building, at a cost of $35,000.

In 1879 some thirty changes were made in the discipline. The distinctive features of the connection are these: In doctrine they follow John Wesley; in government they are half-way between Presbyterianism and Congregationalism; in regard to civil government, they hold that God is the governor of nations, and that the sovereignty of Jehovah, and the supreme authority of his revealed will should be acknowledged by the constitutions of states and nations. Wesleyan Methodists oppose all kinds of oppression and monopoly, and exclude from their fellowship all members of secret societies. Their educational interests center in a flourishing institution of learning at Wasioja, Minn. At Syracuse, N. Y., they have publishing interests to the value of $65,000. They publish there the *American Wesleyan*, a weekly eight-page paper, the *Children's Banner*, semi-monthly, and the *Bible Standard*, a monthly magazine. They have nineteen yearly conferences, in which are 300 ministers, and 18,000 members; churches and parsonages to the value of $600,000.

WESLEYAN UNIVERSITY, in Middletown, Conn., founded by the Methodists in 1831, the oldest college of that denomination in the country. It has graduated 2000 students. It has an endowment of $1,200,000 and an annual income of $100,000. The buildings are the North and South colleges, Memorial hall, Rich hall and Judd hall, all of brownstone; Observatory hall and the Fayerweather gymnasium of brick. These buildings, most of which front an ample and well shaded campus overlooking the Connecticut valley and the surrounding country, are, with the grounds, estimated to be worth $670,000. The library contains about 46,000 volumes, and has an invested fund of $20,000 to secure its increase. The patronage of the institution is derived mainly from thirteen annual conferences of the Methodist Episcopal church, each of which chooses a member for the board of trustees. There are three courses of study of four years each: 1. the classical course, substantially that of the other New England colleges; 2. the Latin-scientific course; 3. the scientific course. The last two are designed particularly for advanced culture in science and modern languages and literature. In all three courses the work of the last two years is nearly all elective. Post-graduate courses are provided in the various departments. The chemical, physical and biological laboratories are extensive and well furnished. Experiments are carried on in the chemical and biological laboratories under the authority of the state and federal governments. The university since 1872 has been open to both sexes. In 1897 it had 34 professors and instructors and 307 students. President, Rev. Bradford Paul Raymond, D.D., LL.D.

WESSEL, JOHANN, called also *Gansfort*, a predecessor of Luther, was b. at Gröningen, 1419, taught philosophy at Cologne, Louvain, Heidelberg, and Paris, and died (1489) in his native town. On account of his learning, he was called *Lux Mundi* (light of the world); while his enemies, on account of his opposition to the scholastic philosophy, termed him *Magister Contradictionum* (master of contradictions). In his doctrine of justification by faith, he forestalled Luther, who esteemed him very highly. After his

death, a large portion of his writings were burned as heretical. Another portion appeared under the title of *Farrago Rerum Theologicarum*, of which Luther published an edition with a preface (Wittenb. 1522), but the most complete edition is that by Joh. Lydius (Amst. 1617). See Ullmann's *Joh. Wessel, ein Vorgänger Luther's* (Hamb. 1834), Bähring's *Das Leben Joh. Wessel's* (1846), and Friedrich's *Johann Wessel* (1862).

WESSEX. See HEPTARCHY.

WEST, BENJAMIN, Anglo-American painter, was b. at Springfield, Penn., Oct. 10 1738, of Quaker parentage, and with lack of opportunity or encouragement, surprised his friends by his skill in drawing at the age of seven years, and at nine painted a picture in water-colors, which, in some points, he declared in after-life, he had never surpassed. His first colors were made from leaves, berries, etc., and his brushes stolen from a cat's tail. Thus self-taught, at the age of 16 he practiced portrait-painting in the villages near Philadelphia, and painted for a gunsmith his first historical picture, "The Death of Socrates." While the society of Friends were discussing the propriety of his becoming a painter, he shocked their principles still more by volunteering in a military expedition in search for the remains of Braddock's army. At 18, he was painting portraits in Philadelphia, and later at New York, where, in 1760, he was aided by some generous merchants to go and pursue his studies in Italy. At Rome, he was patronized by lord Grantham, whose portrait he painted, became the friend of Mengs, and, as the first American artist ever seen in Italy, attracted much attention. He painted his "Cimon and Iphigenia," and "Angelica and Medora," and was elected member of the academies of Florence, Bologna, and Parma. In 1763, visiting England on his way to America, he was induced to remain in London, and in 1765 married Eliza Shewell, to whom he had been engaged before leaving America. His "Agrippina landing with the ashes of Germanicus," attracted the attention of George III., who was his steady friend and patron for forty years, during which time he sketched or painted 400 pictures. His "Death of Gen. Wolfe," painted in the costume of the period, against the advice of all the most distinguished painters, effected a revolution in historic art. For the king, he painted a series of 28 religious pictures for Windsor castle. His best-known works are "Christ healing the Sick," "Death on the Pale Horse," and the "Battle of La Hague." In 1792 he succeeded sir Joshua Reynolds as the president of the Royal academy, but declined the honor of knighthood. Through his whole career he was the generous friend, adviser, and patron of young artists. *The Life and Studies of Benjamin West* were compiled from materials furnished by himself, by John Galt, in two parts (Lond. 1816–20); and a biography of him is also given in Cunningham's *Lives of Eminent British Painters*. He died in London, March 11, 1820, and was buried with great pomp at St. Paul's cathedral. His wife died 1817. Two sons survived him.

WEST, NATHANIEL, D.D., 1794–1864; b. Ireland; studied theology with Dr. Chalmers; came to America, 1834; pastor successively of Presbyterian churches at Meadville, Pittsburg, and Philadelphia, Penn.; chaplain of U. S. hospital, West Philadelphia, 1862–64. He pub. *The Ark of God the Safety of the Nation; Popery the Prop of European Despotisms; Complete Analysis of the Holy Bible; The Overturning of Tyrannical Governments*. His topical analysis of the Bible has had, in various forms, a wide circulation.

WEST, SAMUEL, D.D., 1730–1807; b. Mass.; graduated Harvard college, 1754; ordained, 1764; preached at New Bedford several years; engaged actively in politics and wrote for the newspapers; was a member of the state constitutional convention; was a member of the academies of sciences at Philadelphia and Boston. He published an *Essay on Liberty and Necessity*, in reply to Edwards *On the Will*.

WEST, STEPHEN, D.D., 1735–1819; b. Conn.; graduated Yale college, 1755; taught school at Medford, Mass.; chaplain at Hoosick Fort, 1757; missionary to the Stockbridge Indians, as successor of Jonathan Edwards, 1758; pastor of the church, Stockbridge, 1759–70. He published *Essay on Moral Agency; Remarks on Edwards's Inquiry on the Freedom of the Will; Essay on the Scriptural Doctrine of the Atonement*, etc.

WESTALL, RICHARD, 1765–1836; b. England; apprenticed to an engraver, but became a painter. His best works are water-color drawings of classical subjects. His brother WILLIAM, 1781–1850, studied at the Royal academy, and published several works containing views of English and eastern subjects.

WEST BATON ROUGE, a parish in s.e. Louisiana, having the Mississippi river for its e. boundary, 210 sq. m.; pop. '90, 8363. Co. seat, Port Allen.

WEST BAY CITY, a city in Bay co., Mich.; on the Saginaw river, and the Michigan Central and the Grand Trunk railroads; opposite Bay City, the co. seat. The consolidation of Bay City, West Bay City, and Essexville village has been authorized by the legislature. Both cities have many commercial and local interests in common. West Bay City has about a dozen churches, several planing and flour mills, saw mills, sash mill, and steel and wood ship yards. The cities are connected by bridges across the river and by electric railroads, and have electric lights, national and state banks, and daily and weekly newspapers. Pop. of West Bay City, '90, 12,981.

WESTBOROUGH, a tp. in Worcester co., Mass., on the Boston and Albany railroad, where are manufactories of straw goods, shoes, spring beds, and sleighs, besides a state reform school. The tp. includes the pleasant vill. of Westborough, where are a water-cure

establishment and the Willow Park seminary, churches, and good educational and banking facilities. Pop. of tp. '90, 5195.

WEST BROMWICH, a large and rapidly increasing t. of South Staffordshire, one of the most important towns in the great manufacturing and mining district known as "The Black Country," five m. n.w. of Birmingham. A few years ago West Bromwich was a mere village on a barren heath, and it owes the rapidity of its growth mainly to the rich mines of coal and iron in the vicinity, and to the industries to which these give rise. Very many canals and three railways run through the parish. There are numerous churches, schools, and other important establishments. Pop. '91, 59,489.

WESTBROOK, a former town in Cumberland co., Me.; city charter granted in 1889, and accepted in 1891; on the Presumpscot and Stroudwater rivers and the Portland and Rochester railroad; 6 miles n.w. of Portland. It contains two large villages, electric light and street railroad plants, the latter connecting with Portland, high school, Memorial, circulating, and Cumberland Mills libraries, weekly newspaper, and manufactories of ginghams, silk, paper, cotton, lumber, and other articles. The city has good water-power, capable of much larger development. Pop. '90, 6632.

WEST CARROLL, a parish in n.e. Louisiana, near Arkansas; formed 1877; intersected by Bayous Bœuf and Macon; 380 sq. m.; surface partially covered by forests; soil fertile; chief production, cotton. Pop. '90, 3748. Parish seat, Floyd.

WESTCHESTER, a co. in s.e. New York, having the state line of Connecticut and Long Island sound on the e.; bounded on the w. by the Hudson river, drained by the Croton and Bronx; pop. '90, 146,772, chiefly of American birth, includ. colored. Large portions of the co. were annexed to New York city in 1873 and 1895. It is crossed by ridges of hills, and has extensive quarries of marble, and mineral springs. Its agricultural products and manufactures are important. Co. seat, White Plains.

WEST CHESTER, borough and co. seat of Chester co., Pa.; near the Brandywine river, and on the Pennsylvania and the Philadelphia, Wilmington, and Baltimore railroads; 27 miles w. of Philadelphia. It contains a state normal school, co. hospital, Darlington female seminary, Villa Marie convent, public library, Marshall Square park, Paoli monument, electric light and street railroad plants, waterworks supplied from Chester creek, about 12 churches, and national and private banks. Pop. '90, 8028.

WESTCOTT, Brooke Foss, D.D., b. England, 1825; graduated, Cambridge, 1848; ordained, 1851; assistant master of Harrow school, 1852–69; examining chaplain to the bishop of Peterborough, 1868; canon of Peterborough cathedral, 1869; Regius Professor of divinity at Cambridge, 1870; consecrated bishop of Durham, 1890. He has published *Elements of Gospel Harmony; History of the Canon of the New Testament during the first Four Centuries; Characteristics of the Gospel Miracles; Introduction to the Study of the Gospels; The Bible and the Church; The Gospel of the Resurrection; History of the English Bible.* He contributed to Smith's *Bible Dictionary*, and is one of the revisers of the New Test.; and, with Dr. Hort, issued, 1881, a revised Greek New Testament text.

WESTERBOTTEN, a län in n. Sweden, on the Gulf of Bothnia, adjoining Norway; about 24,000 sq. m.; pop. 1895, 133,336. Capital, Umea.

WESTERLY, a town in Washington co., R. I.; on the Pawcatuck river, and the New York, New Haven, and Hartford railroad; 44 miles s.w. of Providence. It was originally known as Misquamicutt, and was incorporated as the fifth town in the colony in 1669. Westerly is widely noted for its extensive granite quarries and its manufactories of cotton and woolen goods, and printing-presses. The town contains several villages, of which Westerly is the most important, and has electric light and street railroad plants, Soldiers' memorial building, public library, national and savings banks, and daily and weekly newspapers. Pop. '90, town, 6813.

WESTERN AUSTRALIA, a British colony, and the western section of the great island-continent of Australia, embraces the whole of that island w. of the 129th meridian. Its extreme length from n.e. to s.w. is 1370, its average breadth is 650 m., and its area is estimated at 975,920 sq. m. Pop. '96, 122,420. This colony was formed in 1829, and in 1851 had only 5886 inhabitants; but within recent years a considerable number of emigrants have been sent out under the auspices of the government emigration board. Western Australia was formerly named *Swan River Settlement*, from the river Swan, which joins the Indian ocean, after watering a considerable district in the extreme s. w. Of the whole vast area, this district in the s.w. is now, as formerly, the only portion inhabited. There, mountain ranges rising in elevation from the coast inland, run parallel with each other from s. to. n., the highest summit being 5000 ft. above sea-level. The climate is agreeable and salubrious; the soil, both on the coast and in the interior, is light and dry. Bands of fertile land, suitable for the culture of the vine, olive, and fig, occur in the middle districts. Rivers, of which the Swan is the chief, abound; but are not of much use for navigation. Magnetic iron ore, lead, copper, and zinc ores are found in large quantities. Gold is found at Kimberley, Yilgarn, and several intermediate points. Other staple products are pearls and pearl shells, wool, timber, sandal-wood and guano. The colony has had a limited representative government since 1870, but in 1890 the imperial parliament gave it a new constitution, by which a parliament of two houses was constituted, the Legislative Council, or upper house, having 21 members, the Legislative Assembly or lower house, 33 members. The capital is Perth, with an estimated population of (1895) 19,533; the chief port Fremantle, pop. about 9500. Other important towns are Albany, Geraldton, Roebourne, York, etc. W. A. is a "crown colony," having a governor named by the crown.

WESTERN BRANCH, a magisterial dist.; Norfolk co., Va. Pop. '90, 9590.

WESTERN EMPIRE, that portion of the Roman empire of which Rome was the capital, and which comprised (besides Italy), Gaul, Britain, Spain, Africa, Pannonia, Illyricum, and Dalmatia. The partition was made upon the death of Theodosius in 395. His younger son, Honorius, took the western empire—his eldest son, Arcadius, the eastern, whose capital was Byzantium. See BYZANTINE EMPIRE. Between 395 and 476—when Romulus Augustus, better known by the name of Augustulus, was deposed by Odoacer—the western empire had 12 emperors, Honorius (d. 423); Joannes, 425; Valentinian III., 455; Maximus, 455; Avitus, 457; Majorian, 461; Severus, 465; Anthemius, 472; Olybrius, 472; Glycerius, 473; Julius Nepos, 474; and Romulus Augustus. Through the whole period, however, the emperors had little power; actual leadership was with the generals of the armies. Province after province was lost. In 418 the Goths established an empire in Gaul and Spain. The Vandals soon afterward overran Sardinia, Sicily, and other portions. Britain was given up in 451. Dalmatia and Gaul were seized within the next 20 years by Marcellinus and Ægidius respectively; and Rome was almost the only part of the western empire left in 476.

WESTERNORRLAND, a län or province in e. central Sweden, on the gulf of Bothnia; 9837 sq. m.; pop. '95, 217,220. The province is traversed by the Adals, Indals, and Angerman rivers and is moderately fertile. Capital, Hernösand.

WESTERN RESERVE, a tract of land in n.e. O., reserved by Connecticut as a foundation for its school fund, when, 1781, she ceded to the Union all the charter rights claimed by her in the n. w. territory—a narrow strip of land running from the w. boundary of Conn. westward to the Pacific ocean—from which Ohio and other states were subsequently formed. The reserved tract in Ohio contained abt. 3,667,000 acres. It extended 120 m. westward from the Penn. boundary line, was bounded on the n. by Lake Erie and on the s. by 41° n. lat. In 1786 this cession was accepted by congress, and in 1800 an act of congress authorized the pres. to deed to Conn. the title to this W. R. on condition that Conn. would surrender all claims to its jurisdiction. In 1802, on the admission of O. as a state, Conn. lost even this shadowy fiction of a title, but the name W. R. still clings to the soil and is perpetuated in the local nomenclature of public and private institutions. Its settlers were largely from Conn., and its population has been noted for morality and thrift. It was one of the earliest centers of anti-slavery sentiment, has always been active in the interests of education, and has been a stronghold of various moral reforms.

WESTERN RESERVE UNIVERSITY, Cleveland, Ohio, comprises Adelbert college, the college for women, the law school, graduate school, medical college and dental school. Adelbert college was founded at Hudson, Ohio, in 1826. It was removed to Cleveland in 1882. The medical college was founded in 1842. A preparatory school is in Hudson. The value of buildings and property is about $2,500,000. Among the great donors are Amasa Stone and John L. Woods. The university is non-sectarian. The history of the instruction and teaching force has many great names. Among them are Laurens P. Hickok, Elihu Loomis, Clement Long, Charles A. Young, Samuel C. Bartlett and Nathan P. Seymour. In 1896–7 there were 152 professors and instructors and 610 students. President, Charles F. Thwing, D.D., LL.D.

WEST FELICIANA, a parish in s.e. Louisiana, having the state line of Mississippi for its n. boundary, Thompson's creek on the e., and the Mississippi river on the s. and w.; 365 sq. m.; pop. '90, 15,062. Co. seat, St. Francisville.

WESTFIELD, a town in Hampden co., Mass.; on the Westfield river, and the Boston and Albany and the New York, New Haven, and Hartford railroads; 9 miles w. of Springfield. It was incorporated in 1669, and contains the villages of Westfield Centre, East Farms, Mundale, Middle Farms, Little River, and West Farms. The principal industries are the growing and curing of tobacco, and the manufacture of whips, cigars, steam-heaters, bicycles, coffin trimmings, piano legs, organs, and paper. The town has the western state normal school, high school, public library, several national and savings banks, waterworks supplied from Montgomery mountain, electric lights, nearly a dozen churches, and weekly and monthly periodicals. Pop. '90, 9805.

WESTFIELD, a town and village in Chautauqua co., N. Y.; on the Lake Shore and Michigan Southern, and the New York, Chicago, and St. Louis railroads; half a mile s. of Lake Erie, 17 miles s.w. of Dunkirk. It has an academy, Keeley institute, Union school with library, the Patterson library, electric lights, gravity system of waterworks, national bank, woolen, flour, and paper mills, tannery, and large grape-growing interests. Pop. '90, town, 3401; village, 1983.

WEST HOBOKEN, a town in Hudson co., N. J.; opposite New York, and 2 miles w. of Hoboken. It has a public park, electric lights and street railroads, several public and parochial schools, a trust and savings bank, St. Michael's monastery, Dominican convent, several large silk mills, brush and pen-holder factories, and weekly newspapers. Pop. '90, 11,665.

WEST INDIES are already described under Antilles (q.v.). See also the names of the islands themselves—Jamaica, Cuba, Martinique, etc.; as well as the European countries that possess them—Great Britain, Spain, France, Netherlands, etc.

WESTINGHOUSE, GEORGE, Jr., inventor; b. Schenectady, N. Y., 1840; son of a manufacturer of agricultural implements. He was graduated at Cornell university, 1861;

enlisted in the navy as engineer on the ship *Mustcrah*, and, later, in a cavalry company, and while repairing railroads wrecked by confederate raiders, devised a frog for replacing cars. This was patented at the end of the war, and in 1867 he went to Pittsburgh to superintend its manufacture. Soon after he invented the well-known air-brake, and in all has taken out nearly 1,200 patents, including some of the most important connected with the distribution of electricity for light, and the control of electric currents. He was also the pioneer in Pittsburgh and elsewhere in the general introduction of natural gas for fuel purposes, and its distribution, by a system of underground non-explosive pipes, to mills, dwellings, etc.

WEST LOTHIAN. See LINLITHGOW.

WESTMACOTT, Sir RICHARD, R.A., an eminent sculptor, the son of Richard Westmacott, also a sculptor in his day of some little note, was b. in London in 1775, and died Sept. 1, 1856. He was educated in London, and in 1793 proceeded to Rome, where he was in some sort a pupil of Canova ; made rapid progress, and carried off the highest prizes, including a gold medal offered by the pope. He was elected a member of the academy of Florence, but in 1797 returned to London, where, shortly after, he was married to a daughter of a Dr. Wilkinson, then of some medical celebrity. In 1805 he became an associate of the royal academy ; in 1816, an academician. Twenty-one years afterward the honor of knighthood was bestowed upon him. Previously, in 1827, he had succeeded Flaxman as professor of sculpture at the academy, in which capacity he continued to officiate till his death. Among his works are statues in Westminster of Pitt, Fox, Percival, and Addison, and monuments to Abercromby and Collingwood in St. Paul's cathedral.

WESTMACOTT, RICHARD, R.A., son of the foregoing, was b. in London in 1799. After being carefully educated under his father in the art which might seem to run in the family blood, he was sent to Rome in 1820 to prosecute his studies further. In Italy he passed six years; and after his return to London, he gradually won a reputation for himself as one of the ablest sculptors of the day. Besides being eminent in his art, he likewise made himself known as a man of considerable literary and general attainment; and in 1837 he had the honor to be elected a fellow of the royal society. In the year following, the academy recognized his more special claims by assuming him as an associate; and in 1849 he attained the rank of royal academician. On the death of his father, he was appointed to succeed him in the professorship of sculpture, a post which he filled with distinguished ability and acceptance. He died in 1872.

WEST MAHONOY, a township in Schuylkill co., Penn. Pop. '90, 4743.

WESTMANLAND, a län in s.e. Sweden, about 2500 sq. m.; pop. 1890, 136,977. The surface is mountainous. Iron, copper, and silver are mined. Capital, Westeras.

WESTMEATH, an inland co. of the province of Leinster, Ireland, bounded on the n. by the counties of Cavan and Meath, on the e. by Meath, on the s. by the King's county, and on the w. by Roscommon. It lies between n. lat. 53° 8′ and 53° 48′; and w. long. 6° 54′ and 7° 55′. Although not mountainous, its succession of hills and valleys afford much agreeable scenery. It contains good limestone quarries, and marble, copper, and lead also occur. The county contains numerous large lakes, such as Derravaragh, Owel, Ennel, Lene, etc. Pop. '91, 65,109.

WESTMINSTER, THE CITY AND LIBERTY OF, now forms part of the English metropolis. It is bounded by Temple Bar on the e., the Thames on the s., Chelsea and Kensington on the w., and Marylebone on the north. The early history of Westminster is that of the abbey, still the most interesting of its public buildings. In early times, that part of Westminster which adjoins the Thames was surrounded by a branch of the river, so as to form an island called Thorney Island, from its being covered with brush-wood. Here, on the site of the present abbey, Sebert, king of the East-Saxons, is said, in the 7th c., to have built a church. It is supposed to have been replaced by an abbey called Westminster, to distinguish it from the cathedral church of St. Paul's, called, originally, Eastminster. The first edifice erected on the site of which we have any certain account was one built of stone by Edward the Confessor in 1065. The Pyx House, a low apartment, 110 ft. long by 30 ft. wide, vaulted and divided by a certain range of eight plain pillars with simple capitals, is nearly all that remains of it. The principal parts of the existing abbey were built by Henry III. In 1220 he erected a chapel dedicated to the virgin, and a quarter of a century later he took down the old abbey of the confessor, and erected the existing choir and transepts, and the chapel of Edward the Confessor. The remainder of the building was completed under the abbots, the western parts of the nave and aisles having been erected between 1340 and 1483. The w. front and its great window were the work of Richard III. and Henry VII. The latter pulled down the chapel to the virgin, erected by Henry III. at the e. end, and built the chapel known as Henry VII.'s (see illus., CATHEDRALS), completing the interior of the abbey as it now stands; the only important addition made since then having been the upper parts of the two western towers, which were the work of sir Christopher Wren. The whole building forms a cross. Its extreme length, including Henry VII.'s chapel, is 511 ft.; its width

across the transepts is 203 feet. The width of the nave and aisles is 79 ft.; of the choir, 38 ft.; and of Henry VII.'s chapel, 70 feet. The height of the roof is 102 ft., a loftiness unusual in English churches. It is the interior of the abbey which has at all times excited the most enthusiastic admiration. The harmony of its proportions, and the "dim religious light" of the lofty and long-drawn aisles, leave on the mind impressions of grandeur and solemnity which churches of greater size fail to produce. The abbey was at one time the burying-place of the English kings, and it has become a national honor to be interred within its walls. It is crowded with tombs and monuments. The chapel of Edward the Confessor, at the e. end of the choir, contains his shrine erected by Henry III., the altar-tombs of Edward I., Henry III., Henry V., and Edward III. The canopy of that last mentioned deserves especial notice. It is considered to be one of the greatest works in wood extant, and equal to anything in the best age of mediæval art. Against the altar-screen in this part of the church stand the two coronation chairs. One, the king's chair, incloses the stone brought by Edward I. from Scone, on which the Scotch kings were crowned. The other, the consort's chair, was constructed for the coronation of Mary, wife of William III. Both are still used for coronations. Most of the English kings, from the time of Henry VII. down to that of George III., were buried in Henry VII.'s chapel, and there accordingly are the tombs of queen Elizabeth and Mary queen of Scots. The most remarkable monuments in other parts of the church are those in the e. aisle of the southern transept, known as "poets' corner," where many of the most eminent British poets have been buried. There, monuments are erected to Chaucer, Beaumont, Drayton, Cowley, Dryden, Milton, Gray, Prior, Shakespeare, Thomson, Gay, Goldsmith, Addison, and Ben Jonson. In the n. transept are the monuments of Pitt, Fox, Chatham, Canning, and Wilberforce. Elsewhere are the monuments of the great engineers and inventors—Telford, Watt, and Stephenson.

After Dean Stanley (q.v.) became connected with the abbey in 1864, plans were adopted to restore and improve the interior, and services conducted in it have attracted much public interest; more especially the anniversary of the foundation, celebrated on Dec. 28, 1865, and the mission sermon delivered by Prof. Max Müller on Dec. 3, 1873, when the dean of an abbey asserted his right to allow a layman to preach there.

South of the abbey are the Pyx house, chapter-house—since 1866 restored under the direction of sir Gilbert Scott—cloisters, and the building occupied by Westminster school, formerly the monks' dormitory, etc. Westminster School was founded by queen Elizabeth for the education of 40 boys known as queen's scholars, who are prepared for the universities. Other persons send their sons to it, and it has long been one of the leading English public schools.

The city of Westminster sprang up round the abbey, and the English kings, in consequence of the jealousy with which they regarded the privileges claimed by the citizens of London, early took up their abode there. Before Edward the Confessor began to build his new church at Westminster, the residences of the English kings had been the Roman fortress in London, or the Saxon city of Winchester. The king, to superintend the building of the church, took up his abode in the palace. William Rufus, in 1097, erected a palace between the abbey and the Thames. Its chief apartment was a banqueting hall, which, becoming ruinous in the time of Richard II., he pulled down, and erected in 1397–99, on the same site, and indeed on the same foundations, the great hall which still exists. It is 90 ft. high, and 290 ft. long, by 68 ft. wide internally, and is roofed by 13 great ribs of timber, combined with a mechanical skill which has not been excelled in any work of the present age. The roof of Westminster hall is the finest specimen of the purely English art of forming a Gothic roof of wood: with the exception, perhaps, of the hall of justice at Padua, it is the largest roof in Europe unsupported by pillars. The law courts were established at the hall in 1224, and they continue to be held in buildings which rest on the northern side of the building, and open into it by side-doors. These law-courts, as an excrescence and out of place, are to be removed to the new buildings now being erected near Lincoln's Inn Fields.

The old houses of parliament which adjoined the hall, and like it lay between the abbey and the Thames, were burned to the ground in 1834. It was then determined to erect a new building on the same site, but on a much grander scale. The designs of sir Charles Barry for "the new palace of Westminster" were selected as the best, and the work was begun in 1840. The building is the most magnificent erected in Gt. Britain for many centuries. It may be roughly said to form a parallelogram, 900 ft. long by 300 ft. in width. The principal rooms are the House of Lords and the House of Commons, which occupy the centre of the building, and run on the line of its greatest length. They are separated by an "octagon hall," with a diameter of 70 ft. between the walls. From this hall, one corridor runs n. to the house of commons, and another s. to the house of lords, beyond which are the royal apartments at the extreme s. of the building. The entrance to the "octagon hall" is by a passage known as St. Stephen's Hall, which communicates by flights of steps with an entrance in the e. front, and also with Westminster Hall, which, included in the new building, forms its northern vestibule. The state entrance of the queen is at the south-western extremity, and is, of course, in direct communication with the royal apartments. The building is surmounted by lofty spires and towers. In the centre, above the octagon hall, rises the central tower, 300 ft. high. At each corner there are towers; at the s.w. the Victoria Tower, 346 ft. high; at the n.w. the

clock-tower, surmounted by a belfry spire 320 ft. high. The clock has four faces, each 30 ft. in diameter; and it strikes the hours on a bell weighing 9 tons and known as Big Ben. The appearance of the eastern front is still marred by the buildings occupied as law courts, and it is believed that, on their removal, the picturesque outline of the palace, seen from the n.e., will for the first time prove all the merit of the architect's designs. The chief subject of regret in connection with the edifice is, that the stone of which it was built, a magnesian limestone from Yorkshire, has rapidly decayed, and that it has, in consequence, been found impossible to protect the rich ornaments of the exterior from the influence of the atmosphere. Many public improvements have been carried out recently in Westminster, the chief being the construction of the Thames embankment, opened July 13, 1870, which forms a broad and magnificent thoroughfare between the houses of parliament and Somerset house; and the erection of the Indian and foreign offices at the eastern extremity of St. James's park, and thrown open to parliament in December, 1873. See *Historical Memorials of Westminster Abbey* (3d edition, Lond., 1869); *Dedication of Westminster Abbey*, by Dean Stanley; *The Memorials of Westminster*, by Rev. Mackenzie E. C. Walcott (1851).

WESTMINSTER, Hugh-Lupus Grosvenor, Duke of, b. London, 1825; son of Richard, second marquis; succeeded to the marquisate in 1869, and was created Duke in 1874. His vast landed estates won for him the reputation of the wealthiest of English nobles. He was a member of parliament for Chester, 1847-69, and is a member of the liberal party.

WESTMINSTER ASSEMBLY OF DIVINES and Westminster Standards. See Creeds and Confessions.

WESTMORELAND, a co. in s.w. Pennsylvania, having the Alleghany river for its n.w. boundary, the Conemaugh and Kiskiminetas rivers on the n. and n.e., the Pennsylvania canal on the n. border, drained by the Youghiogheny and other streams; 1035 sq. m.; pop. '90, 112,819. Co. seat, Greensburg.

WESTMORELAND, a co. in e. Virginia, having the Potomac river on the e. separating it from Maryland, the Rappahannock river on the w., the birthplace of Washington, James Monroe, and Richard Henry Lee; 170 sq. m.; pop. '90, 8399. Co. seat, Montross.

WESTMORELAND, a co. in s.e. New Brunswick, Dominion of Canada, bounded by the strait of Northumberland and the bay of Fundy; 1284 sq. m.; pop. '91, 41,477. The Petitcodiac river forms part of its s.w. boundary. Co. seat, Dorchester.

WESTMORELAND, a co. in the n.w. of England, bounded on the e. by Yorkshire, on the s. and w. by Lancashire, and on the n. by Cumberland and Durham. Area, 783 sq. m. Tillage is mostly confined to the valleys. There is some lead mining; the manufactures of Westmoreland are unimportant, being for the most part confined to the spinning of wool, the manufacture of hosiery, and the weaving of coarse woolen stuffs. Pop. '91, 66,098. The surface is almost wholly mountainous, the chief summit being Helvellyn (3055 ft.) partly in Cumberland. The other more important summits are Loughrigg fell, Bowfell, Crossfell, and High street and Langdale pikes. Lakes remarkable for their beauty occur. The chief are Windermere (q. v.), partly belonging to Lancashire; and Ullswater (q.v.), between Westmoreland and Cumberland. Moorlands are numerous and extensive; but along the courses of the Kent in the s., and the Eden in the n.—the principal streams—there are tracts of fertile land. The climate is mild and moist, often with much snow in winter, the deep wreaths of which frequently prove fatal to travelers on the mountain tracks. The soil is mostly a dry gravelly mold, favorable to the culture of turnips, of which great crops are produced. Rich pasture-lands abound, and cattle, mostly of a large size, are extensively reared. The county town is Appleby.

WESTON, a co. in n.e. Wyoming; 4830 sq. m.; pop. '90, 2422. Co. seat, Newcastle.

WESTON, Thomas, b. England, in the last quarter of the 16th c.; a London merchant, who advanced £500 for Plymouth colony in 1620. Two years later he began a settlement of his own at Wessagussett (Weymouth), coming over himself. His colonists proved to be a thriftless set; most of them went to Plymouth, and Weston himself soon returned to England. He died after 1624.

WESTPHALIA, a province of Prussia, lies between Holland, Hanover, Brunswick, Hesse-Nassau, and the Rhine province. Its area is 7802 English sq. m., with a pop. '95, of 2,701,420, who, with the exception of about 20,000 Jews (1890), are of the purest German descent. Of the population 1,250,603 were, in 1890, Catholics, and 1,152,985 Protestants. Westphalia is divided into three districts—Münster in the n.w., Minder in the n.e., and Arnsberg in the south. The e. of the province presents vast plains covered with grain, while the n.w. exhibits an uninterruptedly flat expanse of uncultivated land. The climate is generally temperate. The chief rivers are the Weser (q.v), the Ems, the Lippe, and the Roar, or Ruhr, each of which is navigable for a considerable part of its course. Its chief agricultural products are rye, oats, wheat, buckwheat, potatoes, pulse, garden vegetables, hemp, and a very fine grade of flax. The prosperity of Westphalia is chiefly due to its mineral treasures, especially coal and iron. The chief of the industrial products are iron, and articles of iron, steel, and copper from the forges of Arnsberg; while manufacturing industry embraces flax-spinning and linen-weaving, machine-making, and many other branches. The exports consist of these products, and of

meat, especially hams. The capital, Münster (q.v.), had, till 1818, a university, now a higher academy, and is the seat of the supreme Catholic and Protestant religious authorities.—Westphalia derives its name from the Westfalen, a section of the great Saxon people, who migrated hither from the banks of the Elbe soon after the Christian era; and after the subjugation of the Saxons by Charlemagne, the deposed leader, Wittekind, was allowed to remain *duke of the Engern and West-falen*. At this time, the country called Westphalia (and occasionally denominated *Sauerland*) comprised all Germany between the Weser, Rhein, and Ems; and soon after, it was subjugated by the dukes of lower Saxony, and held by them till, on the rebellion of Henry the Lion in 1179, the electoral archbishop of Cologne extended his sway over it. It then became one of the circles of the empire, and belonged to the Cologne electorate till 1802, when most of it was given to the Hesse-Darmstadt family. In 1807 arose the *kingdom of Westphalia*, which, besides a portion of Westphalia, also included electoral Hesse, Hanover, Brunswick, and portions of upper Saxony. This kingdom, erected by Napoleon as a preliminary to its incorporation into France, was given to his youngest brother, Jerome, who made Cassel his capital, and, despite the large French garrisons with which the country was burdened, and the extensive contributions in men and money which it was forced to pay to Napoleon, succeeded, by the establishment of the code Napoleon, and by showing in various other ways his strong desire to promote the welfare of his new subjects, in acquiring their esteem. But the oppressive conscriptions and taxes for the behoof of the French army and treasury gradually increased in amount, and excited such resentment, that Jerome's life was several times threatened. The king repeatedly remonstrated with Napoleon, but without the slightest effect; and despite his efforts, the "continental system" was introduced into his states. In 1813 Jerome was chased from Cassel by the Russians; and though he returned for a few days, the defeat of Leipsic forced him to take shelter in France. By the treaty of Vienna, the states which had been joined to Westphalia to form the kingdom, were restored to their former possessors, and Westphalia itself, with the exception of a portion which had been annexed to Hesse-Darmstadt, was united to Prussia.

WESTPHALIA, Treaty of, also known as the *treaty of Münster*, was concluded at Münster and Osnabrück (towns in the circle of Westphalia) in 1648, and in putting an end to the thirty years' war (q.v.), restored tranquillity to Germany, established a new system of political equilibrium in Europe, and became the basis of all subsequent treaties down, till the French revolution. The minor states of Germany had long desired a cessation of hostilities; and as early as 1638 plenipotentiaries from France, Sweden, and the empire had assembled at Hamburg; but it was not till several years after, that all parties agreed to Münster and Osnabruck as the places and to Mar. 26, 1642, as the time of meeting of the congresses. Ferdinand, however, was very loath to commit himself to a definite negotiation till the success of his arms, the hope of succor from Spain, or a change in the French policy, should give him less the position of a beaten opponent willing to accept almost any terms; and he accordingly temporized from time to time till his hopes of succor had vanished. In 1644, the congresses opened, the two places of meeting having been chosen to avoid any rivalry between France and Sweden for supremacy, to prevent any collision between the Swedish representatives and the pope, and to separate the Catholics from the Protestants. The representatives of France, the empire, Spain, and the Catholics of Germany, met at Münster under the mediation of the pope and those of Sweden, the empire, and the Protestants of Germany, under the mediation of the king of Denmark; the representatives of Spain, Portugal, the United Provinces, Savoy, Tuscany, Lorraine, Mantua, and Switzerland being also present; so that this congress included all the great European powers except Britain, and almost all the minor powers. As the conflict was still carried on with undiminished vigor, the inclination of fortune to one side was the signal for excessive demands, which were met on the other side by evasive proposals; and it was not till Torstensohn's decisive campaign of 1644–45 that negotiations commenced in earnest, and the representatives made specific propositions. The successes of Turenne and Wrangel, in southern Germany, and the capture of Prague by the Swedes under Königsmark in July, 1648, at length overcame all the emperor's dilatoriness, and, the Osnabruck representatives having arrived at Münster a few days before, the treaty was finally signed at Münster, Oct. 24, 1648. Its terms, as regards the Germanic empire, were as follows: The sovereignty and independence of the different states of the empire were fully recognized, and liberty was given them to contract any alliances with each other, or with foreign powers, if these were not against the emperor or the empire; all religious persecution in Germany was forbidden; the treaty of Passau and the religious peace of 1555 were confirmed; and with respect to the secularization of ecclesiastical benefices, everything was to remain in Austria as it was in 1624 (hence called the *normal year*), and in the Palatinate, Baden and Würtemberg as it was in 1618; the power of putting under the ban of the empire was only to be exercised with consent of the diet; and the Reformed were put on a footing of equality as to privileges with the Lutherans. The territorial changes were as follows: The Lower Palatinate was restored to the eldest son of the unfortunate "Winter king" (Frederick V., elector palatine), and an eighth electorate was created in his favor, but the Upper Palatinate and Cham were given to Bavaria, on condition that,

should the two states become united, one electorate was to be abolished (as happened in 1777, see BAVARIA); part of Alsace was ceded to France; Upper Pomerania, Rugen with Stettin, Gartz, Damme, Golnau, the isle of Wollin, Peine, Schweine, and Divenau in Lower Pomerania, Wismar, the secularized archbishopric of Bremen as a duchy, and the bishopric of Verdun as a principality, were obtained by Sweden as fiefs of the empire, with three deliberative voices in the diet, and an indemnification of 5,000,000 crowns to be paid by the empire; Brandenburg obtained, as compensation for its cessions in Pomerania, the secularized archbishopric of Magdeburg as a duchy, and the bishoprics of Halberstadt, Minden, and Camin; Hanover and Mechlenburg were compensated for their share in these cessions by secularized church lands; and Hesse-Cassel obtained the rich abbacy of Hirschfeld, with 600,000 thalers. The independence of the United Provinces was recognized by Spain, and that of Switzerland by the empire. The pope's agent, Fabio Chigi (afterwards Pope Alexander VII.), protested vigorously against the liberal alienation of the possessions of the church, and withdrew; and the king of Denmark's mediation being stopped by his war with Sweden in 1644, the treaty was concluded under the sole mediation of the republic of Venice, and France and Sweden became guaranties for its execution. France, Sweden, and the Protestants were the only gainers by this treaty, which, by weakening the great central authority of the empire, destroyed its unity, allowed France, as one of the guarantees, a pretext for continual interference with its internal affairs, and gave the *coup de grace* to the independence of the remaining free cities of the empire.

The treaty of Westphalia is one of the most important international compacts in the history of Europe. It formed the basis of international relations down to the Congress of Vienna in 1815. In it there was a distinct recognition of the principle of the balance of power. As a result of it France became the chief nation of the Continent, taking the place formerly occupied by Spain, and Sweden took rank as the chief northern power. It marks the close of the period of religious wars. Henceforth European contests were mainly for political ends.

WEST POINT, a U. S. military reservation in Orange co., N. Y. It is the site of the U. S. Military Academy; on the w. bank and in the s. angle of a bend in the Hudson river, where it breaks through the Highlands; 52 m. n. of New York City; 94 m. s. of Albany. The West Shore railroad passes by tunnel under the parade ground and the Hudson river steamboats stop daily at this place. In 1775 fortifications were erected on Constitution Island, in the n. angle of the river bend, and at Forts Montgomery and Clinton at the mouth of Pooplopen's creek, 4½ m. to the s. In 1777 the British captured and demolished these fortifications, but new ones were begun, 1778, under the supervision of Gen. Putnam, by Lieut.-Col. Radière, who was relieved by Gen. Kosciusko. They had cost $3,000,000 by 1780, and were never finished. Fort Putnam, 596 ft. above the river, was the principal one, and below it were Forts Webb, Wyllys and Meigs, also a new Fort Clinton in the n.e. angle of the plateau. Batteries and redoubts were erected at other points, and in addition a boom and massive iron chain were stretched from the point to Constitution Island. In 1779 Washington established his headquarters here, and in 1780, Aug. 5, Benedict Arnold took command, fleeing on the 25th, on the capture of André, and the exposure of their plot. In 1790 the U. S. government bought a tract of 2100 acres, and in 1824 the remainder; the state relinquishing jurisdiction over a part in 1826 and over the rest in 1875. The pass in the river is a noted feature of American scenery. W. P. has a strong natural position, being protected on the s. and n.w. by rocky heights, 500–1500 ft. high, and on the river side by an almost perpendicular wall. Only one fort, Clinton, has been restored, and this but partially. The academy stands on a plateau about 180 ft. above the river. The main buildings are on the s. side; the houses of the instructors and officers on the w.; the barracks, storehouses, etc., on the n.w., comprising what is called Camp Town. The principal buildings are the academic building, barracks, mess hall, observatory and library, ordnance museum, and the chapel, with its memorial tablets. Among interesting monuments are the statue of Gen. Sedgwick, the monument to Maj. Dade and his command, and that to Kosciusko, erected by the cadets of 1828. A small ledge along the steps leading to the river is called Kosciusko's garden. West Point foundry is situated n. of Constitution Island at Cold Spring. See UNITED STATES MILITARY ACADEMY.

WEST PRUSSIA. See PRUSSIA.

WEST SPRINGFIELD, a town in Hampden co., Mass.; on the Connecticut and Agawam rivers and the Boston and Albany railroad; 1 mile w. of Springfield. It was incorporated in 1774, and contains the villages of West Springfield Centre, Ashleyville, Riverdale, Tatham, Amostown, Prospect Hill, Mittineague, and Merrick. It has a high school, public library, repair shops of the Boston and Albany railroad, and several churches, and is principally engaged in market gardening and the manufacture of paper. Pop. '90, 5077.

WEST SUPERIOR, a local and business designation of a portion of the city of Superior, Douglas co., Wis., having no legal interests distinct from SUPERIOR (q. v.).

WEST TROY, a former village in the town of Watervliet, Albany co., N. Y.; on the Hudson river and the Delaware and Hudson railroad. In 1896 the town, with the villages of Green Island and West Troy, was chartered as a city, under the name of WATERVLIET (q. v.).

WEST VIRGINIA, the 22d state in order of admission, lies between lat. 37° 40′ and 40° 30′ n., and long. 77° 40′ and 82° 40′ w.; and is bounded n. by Pennsylvania and Maryland, e., s.e. and s. by Virginia, and w. by Kentucky, from which it is divided by the Big Sandy river and Ohio, from which it is separated by the Ohio river. Its greatest length n. and s. is about 240 m., its greatest breadth, 160 m.; land area, 24,645 sq. m.; gross area, 24,780 sq. m., or 15,859,200 acres.

The arms of West Virginia consist of a rock bearing on its face "June 20, 1863," the date of the inauguration of its first governor. On either side the rock stand a farmer and a miner with their implements of labor. Below the rock are two rifles crossed under a liberty cap. The motto is "*Montani semper liberi*," meaning "Mountaineers are always freemen." The popular names of the state are the "Panhandle State" and the "Mountain State."

History.—West Virginia became a state as a result of the breaking out of the civil war in 1861. Up to that period it had formed the w. and n.w. portion of the commonwealth of Virginia. When the commonwealth seceded, however, the people of the western portion protested, and in May, 1861, met in convention to denounce the ordinance and order an election the following October to decide upon the question of organizing a new state embracing 39 counties, to be called the state of Kanawha. The votes of these counties were nearly unanimous, and a constitution was prepared and ratified by the people in May, 1862. Shortly afterward the consent of the Virginia legislature was given for the formation of the new state, the name of which in the mean time had been changed to that it now bears, and on Dec. 31 congress provided for its admission, upon the ratification by the people of the proposed amendment to the constitution abrogating its provision that no slave or free colored person should come into the state for permanent residence. The amendment was ratified March 26, 1863; on May 28 state officers were elected; and immediately after the admission of the state, June 20, the state government was inaugurated at Wheeling, the chosen capital. The military operations that had taken place within the territory of the new state had occurred in 1861, when the confederate forces were driven out. Immediately after the state was admitted to the union it provided the union army with 26,540 men. The state then comprised 48 counties; but four more were added after the war, and since then its progress in education, commercial enterprise, and railroad development has been rapid and notable. In 1870 Charleston was made the capital; in 1875 Wheeling again became the seat of government, but in 1885 Charleston was made the permanent capital. For map of West Virginia, see Virginia.

Topography, Flora, Fauna, etc.—Much of the state is mountainous, being traversed by ridges of the Appalachians, such as the Cheat, Laurel, Greenbrier, Cancanon, Cowpasture, Flat Top, Rich, Briery, Gauley, Birch, Sewell, and Meadow Mountains, which are generally fertile to the top and well wooded. The country slopes w. to the valley of the Ohio, and excepting the Potomac, which forms a part of the boundary between the state and Maryland, and its affluents, the rivers of West Virginia are tributary to the Ohio. The most important of these flowing directly into that river are the Big Sandy, Guyandotte, Great Kanawha, Little Kanawha, and Monongahela, all of which are navigable. The geology and mineralogy of the state comprises eozoic rocks in Jefferson county, on the eastern edge; lower silurian limestone and Medina sandstone; soft shales and clay slates; and coal measures that cover more than 16,000 sq.m., which contain every quality of cannel, splint, coking, block, and bituminous coal yet discovered, and all of them in thick and easily worked veins. Salt also, a usual deposit in the coal measures, is found in springs of great strength and purity of brine, and at numerous points on several of the rivers already mentioned are several large salt works. Common tufa, hydraulic, and building limestones, fire-clay, potter's clay, glass sand, ocher, barytes, black oxide of manganese, and saltpeter are found in abundance, and zinc, copper, and lead in moderate quantities. The soils of the state may be classed as clay soils, which contain 75 per cent and over of clay; sandy soils, containing 75 per cent of sand; and loams, composed of clay and sand mixed in about equal proportion. The last, however, is said to be the characteristic soil, and the greater part of the coal-measures are covered by it. The principal forest trees are the white, black or water, blue, green, and mountain ash; the aspen, beech, water-beech, black and red birch, fetid and sweet buckeye; cedar, wild-cherry, chestnut, Kentucky coffee tree, cottonwood, dogwood, and witch elm; black and southern balsam, fir, and the hemlock, spruce, the black or sour gum, and the sweet gum, three species of hickory, the magnolia, persimmon, sumach, holly, locust, linden, red maple, red mulberry, twelve species of oak, the poplar, sycamore, black walnut, and butternut. Altogether over 9,000,000 acres are covered with forests. The wild animals found in the state include the panther, wild-cat, lynx, wolf, black bear, raccoon, opossum, elk, deer, rabbit, and hare. The climate is generally free from extremes of heat or cold. In the highland sections the air is pure and healthful and favorable to persons having pulmonary diseases. The mean annual temperature has been found to be 56.4°, and the rainfall about 44.2 inches. The state is famed for its mineral springs, among which are those at Berkeley, that once belonged to the estate of Lord Fairfax, and are the oldest pleasure resort in the south; the Greenbrier White Sulphur Springs, believed by the Shawnee Indians to be a fountain of health, and now a favorite resort for tourists; the Capon Springs; the Red Sulphur Springs, said to be like those of Eaux Bonnes in the Pyrenees; and the Parkersburg Mineral Wells.

Industries.—About two-thirds of the population are engaged in agriculture. The annual production of wheat exceeds 4,000,000 bushels; of corn, 21,000,000; of

oats, 3,800,000, besides large quantities of hay, tobacco, potatoes, sweet potatoes, hemp and flax, wool and live stock. This state ranks fourth in the production of coal, its coal fields covering 16,000 acres, and producing over 11,000,000 tons annually. In the production of coke it ranks second, producing over 1,285,000 tons annually. The U. S. census of 1890 reported for West Virginia, 2376 manufacturing establishments, employing $28,118,030 capital and 21,969 persons, paying $8,330,997 for wages and $23,729,089 for materials, and having a combined output valued at $38,702,125. The principal manufactures are iron and steel, lumber and planing mill products, flour and grist mill products, and iron and steel nails and spikes. Wheeling is sometimes called the "Nail City;" the first glass works were established there in 1820. Large quantities of fine pottery are also made. Parkersburg, in the petroleum region, has large refineries and other factories; Charleston, in the Kanawha Valley, is the center of the salt industry; Martinsburg has railroad shops, and bromine is made in large quantities at Clifton.

Railroads. — The principal railway systems are the Baltimore and Ohio, the Chesapeake and Ohio, and the Norfolk and Western, and there are also several local lines. The total length of railroads is over 2000 miles; capital, $43,000,000; funded debt, $26,000,000; total investment, $76,000,000; cost of roads and equipments, $69,500,000; net earnings, $1,250,000. Several narrow-gauge lines are also operated in the mountain regions. Whatever foreign commerce the state has is carried on by way of New Orleans. In 1896 an important undertaking was planned in the New river section of the state. This was the building of the Glenjean, Lower Loup Creek, and Deepwater railroad and involves the construction of a bridge over the Kanawha at Deepwater.

Banks. — On Oct. 31, 1896, there were 33 national banks in operation, with capital, $3,451,000; deposits, $7,128,282; reserve, $1,799,581; and outstanding circulation, $1,236,082; and 59 state banks, with capital, $3,265,550; deposits, $10,352,562; and resources, $15,496,391.

Religion, Education, etc. — The leading religious denominations are well represented; the strongest denominations numerically being the Methodist Episcopal, Baptist, Methodist Episcopal South, Roman Catholic, United Brethren, Methodist Protestant, Presbyterian South, Disciples, Presbyterian North, Baptist Colored, and Dunkard.

The free-school system, though of recent origin, is in efficient operation. The supervision and management of the schools are vested in a state superintendent, elected every four years; county superintendents, elected every two years; and district boards and trustees. The constitution prohibits the teaching of white and colored children in the same school, and provision is made for separate schools for the colored. In 1896 the school population was 285,600; enrollment, 215,665; average daily attendance, 141,081; public school buildings, 5475; value of public school property, $3,227,140; expenditure for public education, $1,793,650. There were about 6500 public school teachers. The private school enrollment was estimated at about 2000. There are public normal schools at Concord Church, Fairmont, Farm, Fayetteville, Glenville, Huntington, Shepherdstown, and West Liberty, and private ones at Harpers Ferry and Summersville. The higher institutions are the state university at Morgantown; West Virginia College (F. W. Bapt.), Flemington; Bethany College (Christ.), Bethany; Barboursville college (M. E., S.), Barboursville; an agricultural and mechanical college for white students, at the state university; West Virginia colored institute, at Farm; and Storer college (Bapt.), an industrial and normal school for colored students, at Harpers Ferry. For the defective classes there are a state institution for the deaf, dumb, and blind, at Romney, and a state reform school at Pruntytown. In 1897 there were 178 periodicals of all kinds.

Government, etc. — The constitution of the state gives the right of suffrage to all male citizens 21 years old, with the usual exceptions, who have resided in the state one year, and the county 60 days, preceding the election; and only qualified voters are entitled to hold any state, county, or municipal office. The governor, state superintendent of free schools, auditor, treasurer, and attorney-general are elected by the people for the term of four years.

The governor's salary is $2700. The legislature, having biennial sessions, consists of a senate of 26 members and a house of delegates of 71 members. The sessions begin in January and are limited to 45 days. The state elections are held in November. The judicial power is vested in a supreme court of appeals consisting of four judges, thirteen circuit courts, and fifty-five county courts. The state penal and charitable institutions are a penitentiary at Moundsville, hospitals for the insane at Weston and Spencer. The United States government has buildings at Wheeling, Clarksburg, Parkersburg, and Charleston. The national guard of the state has an authorized strength of 1438 officers and men, and an actual strength of 871. The total liable to military duty is 121,604. A law enacted in 1872–73 forbids the retail sale of intoxicating liquors without license, and provides for the collection of damages by the families and friends of drunkards. Wilful desertion for three years entitles the petitioner to a divorce, provided he or she has resided one year in the state. The registration of voters is prohibited by the constitution in this state. New ballot laws based on the Australian system (q. v.) were adopted in 1891.

The electoral votes have been cast as follows: 1876, Tilden and Hendricks, 5; 1880, Hancock and English, 5; 1884, Cleveland and Hendricks, 6; 1888, Cleveland and Thurman, 6; 1892, Cleveland and Stevenson, 6; 1896, McKinley and Hobart, 6.

Finances. — The 1890 United States census report gave the state debt, $184,511; county debt, $1,197,462; municipal debt, $1,132,188; school district debt, $18,299; total combined debt, less the sinking fund, $2,532,460; debt per capita, $3.32. In 1896 the

assessed valuation was $215,669,932; public debt, none. The legal and only rate of interest is six per cent., and the penalty for usury is forfeiture of excess of interest. Judgments and notes outlaw in ten years, open accounts in five years.

POPULATION.—In 1860 this amounted to 376,688; in 1870, to 442,014; in 1880, to 618,457, including 25,760 colored and 18,223 of foreign birth. In 1890 the population was 762,794—32,690 colored, 15 Chinese and 9 Indians, and its relative rank was 28. There are 55 counties; for pop. 1890, see Census Tables, Vol. XV. The largest cities were Wheeling, 34,522; Huntington, 10,108, and Parkersburg, 8408.

WETMORE, PROSPER MONTGOMERY, 1798–1876; b. Conn., went into business in New York. He began to write for the periodicals when 18 years of age and soon became a figure in the literary and artistic society of New York. His *Lexington, with other Fugitive Poems*, appeared in 1830. Eight years later he published, with a memoir, an edition of the poems of James Nack, and in 1847 *Observations on the Origin and Conduct of the War with Mexico*. He served in the legislature, where he was chairman of the committee on colleges and academies.

WETS. A popular name for any party or body of voters opposed to prohibition (q.v.). See PARTY NAMES (*Drys*).

WETSTEIN, the name of a Swiss family illustrious for the talents and learning of its members, originally from Kyburg, in the canton of Zürich. Among the more noteworthy are—(1.) JOH. JAKOB WETSTEIN, born at Basel in 1594, who was first in the service of the Venetian state. In 1620 he became a member of the supreme council of his native town; represented Switzerland at the peace of Westphalia (1648); was raised to the rank of a noble in 1653, and died in 1666.—(2.) JOH. RUD. WETSTEIN, son of the preceding, was born at Basel in 1614, and died there in 1683, professor of theology. He was a great opponent of the introduction of the *Formula Consensus*, and assisted Suicer in drawing up his *Thesaurus Ecclesiasticus*.—(3.) JOH. RUD. WETSTEIN, son of the preceding, born at Basel in 1647, and died there in 1711; also professor of theology, favorably known as an early editor of Origen.—But the most distinguished member of the family is JOH. JAK. WETSTEIN, son of Joh. Rud. Wetstein, the younger, who was born at Basel, Mar. 5, 1693. After a thorough study of the classics, Hebrew, philosophy, and mathematics, he was made a PH. D. at the age of 16. Four years later, he became a minister, and gave himself up to the study of the New Testament. In 1717 he began to give lessons in theology at the university of Basel, and continued to do so until 1730, when (being suspected of Socinianism) he was forced to leave Switzerland. He sought an asylum in Holland, where the Remonstrants appointed him professor of theology at Amsterdam in 1733. He died there Mar. 23, 1754. Wetstein's great work is his edition of the New Testament, with prolegomena, a collection of various readings, and Latin notes (2 vols., Amst. 1751–52). Its publication marks an epoch in the history of New Testament criticism. Semler reprinted the prolegomena with additions.

WETTE, DE. See DE WETTE.

WETTER, LAKE, after lake Wener (q.v.), the largest lake in Sweden, lies in Gothland, about 25 m. s.e. of lake Wener in direct line. It is 70 m. long, 13 m. in average breadth, has an area of 850 sq.m., is 370 ft. in greatest depth, and is 300 ft. above the level of the Baltic. It receives about ninety small tributaries, though its waters have only one outlet, the Motala river, which, flowing eastward, maintains the communication of the lake with the Baltic. Its waters are clear, and of a beautiful green color, and it is surrounded by lofty romantic shores, almost unbroken by bays. It is remarkable for an irregular alternation of risings and fallings, and for an occasional undulation, which is so rapid and violent as to break the thick sheet of ice with which it is covered in winter. An intricate chain of small lakes, continued westward by the Göta canal, connects lake Wetter with lake Wener, and thus with the Cattegat. Lake Wetter contains few islands, and of these the chief is Wisingsö, 7 m. long by 1¼ m. broad.

WETTERHORN (Peak of Tempests), a lofty mountain of the Bernese Oberland, Switzerland, on the e. side of the Grindelwald, and about 10 m. s.e. of the lake of Brienz. From the path by which it is ascended, it rises in one vast precipice of alpine limestone, seeming to threaten the traveler. The three peaks of the Wetterhorn are respectively 12,149, 12,166, and 12,110 ft. high.

WETZEL, a co. in n. West Virginia, having the Ohio river for its n.w. boundary; 550 sq.m.; pop. '90, 16,841, chiefly of American birth, with colored. Co. seat, New Martinsville.

WETZLAR, a small t. of Rhenish Prussia, charmingly situated on the Lahn, 40 m. n. of Frankfort-on-the-Main. Part of its old cathedral is said to date from the 11th century. Wetzlar is notable as the scene of the *Sorrows of Werther*. Pop. '90, 8144.

WEXFORD, a co. in n.w. Michigan, drained by the Manistee river and its branches; containing lake Otisgo and other small lakes; 580 sq.m.; pop. '90, 11,278, chiefly of American birth, with colored. Co. seat, Cadillac.

WEXFORD, a maritime co. of the province of Leinster, Ireland, is bounded on the n. by the county of Wicklow, on the e. by the English channel, on the s. by the Atlantic, and on the w. by the counties of Waterford, Kilkenny, and Carlow. Its greatest length n. and s. is 55 m., and its greatest breadth e. and w. is 34 miles. The total area comprises 900 sq. m., or 576,588 acres. Pop. '81, 123,854, of whom 112,710 were Catholics, 10,015 Episcopalians, and the rest Protestants of other denominations. The coast-line of Wexford, which extends from Kilmichael point to the estuary of the Suir, Waterford harbor, is irregular, and very dangerous for shipping. From the above-named point to Wexford harbor there is no opening for navigation; and as Wexford harbor, besides being intricate and dangerous, is also obstructed by a bar, it offers little security in boisterous weather; but considerable improvements have lately been made. The coast from the southern headland of Wexford harbor, Rosslare point, to the mouth of the Suir, presents a succession of bays and headlands. The headland called Carnsore point is the s.e. extremity of Ireland. Parallel with the northern coast-line, at a distance of a few miles, is a range of sandbanks; and the southern shores are beset by outlying rocks and islets, which, although somewhat guarded by light-houses and light-ships, frequently prove fatal to shipping. The greater part of the surface is tolerably level, but some detached hills rise to considerable elevation. The mountains of the border are much more elevated, the highest point of the Blackstairs being 2409 ft.; and of mount Leinster, 2610. There are few lakes, and these of small size. The principal river is the Slaney, which for some distance is the boundary between Wexford and Carlow, but enters Wexford near Newtownbarry, whence it flows by Enniscorthy into the sea in Wexford harbor. In its geological structure, Wexford belongs to the eastern clay-slate tract, which stretches in a south-westerly direction from the n. of Wicklow to the Atlantic, and which extends across the level districts as far as the granite range separating Wexford from Carlow. Granite is found in the s.e. of the county, and in some of the detached hills, as are also beds of greenstone. Silver was formerly raised near a place called Clonmines, where traces of an ancient mine are still seen, and galena has been found in the same place. Copper ore, plumbago, and asbestos are also found. The climate is said to be singularly temperate, and the district is more suitable for agriculture than the counties of Carlow and Kilkenny, although inferior in fertility. Oats and barley are the principal crops. The breeds of live-stock have been recently so much improved that Wexford has carried off first prizes at various cattle shows. There are but few and inconsiderable manufactures, and the trade is chiefly in the export of agricultural produce, especially barley; butter, cattle, pigs, poultry, and eggs are also exported in large quantities. Wexford is divided into ten baronies. Of these the barony of Forth is very remarkable as having preserved, from the 12th c. down to the very last generation, a dialect of English quite peculiar, as well as many peculiar usages and social habits. The principal towns are Wexford (q.v.), Enniscorthy, New Ross, and Gorey; and Duncannon is noticeable for its ancient fort and interesting historical associations. The maritime position of Wexford laid it open early to the incursions of the Danes, to whom the name Wexford, or Weisford, is traced by antiquaries. It was the first landing-place of the English in the invasion, and formed part of the tract granted to them by MacMurrough. By the marriage of Strongbow with Eva, MacMurrough's daughter, it came into his hands; and after the partition of his lands among his daughters at his death, Wexford underwent many changes of masters. During the civil wars which followed 1641, Wexford was the scene of frequent contests; and in the more recent insurrection of 1798, it formed the theater of the only formidable conflicts of the peasantry with the regular troops. There are numerous relics of antiquity, Celtic as well as Anglo-Norman, in almost every part of the county. Upward of a hundred castles are still traceable, and many ecclesiastical remains, of which the monasteries of Dunbrody, Tintern, Ross, and some others are not unworthy of the best days of mediæval architecture. Wexford returns two members to parliament.

WEXFORD, capital of the county of that name, a seaport, and parliamentary and municipal burgh, is situated at the mouth of the river Slaney, 82 m. s. from Dublin, with which it communicates by the Wicklow, Wexford, and Waterford railway now completed. The town is situated on the south-western shore of the estuary of the Slaney, which is known as Wexford harbor, and along which the quay extends nearly 1000 yards, forming a spacious and not inelegant terrace. Behind this the town extends in two nearly parallel streets. There are two Protestant and three Catholic churches. Of the latter, two are modern and handsome structures. One of the former, St. Selsker's, is ancient, part of its walls dating from the English invasion. There are also a Presbyterian, a Methodist, and a Quaker meeting-house; a convent of Franciscan friars, five nunneries, a Roman Catholic college, and National, Christian Brothers', and conventual schools. Besides the union workhouse, there are also an infirmary and a fever hospital. The only manufactures of any importance pursued are those of distillation and the grinding of corn. The position of Wexford for export trade, favorable in itself, is much marred by the shallowness and intricate character of the channel of the Slaney, which has the further disadvantage of being obstructed by a bar. Great improvements have been made, a patent slip and dock have been constructed, steamers are employed in the export of cattle and provisions, and an active shipping trade is carried on. The Wexford fisheries also have long been reckoned among the most valuable on the eastern coast. The town is extremely ancient, and was occupied by the Danes as one of their strongest settlements. From the time of the invasion, it became an English stronghold against the

native population. During the civil wars of 1641, it was occupied by the confederated Catholics, but was taken by Cromwell in 1644. The insurgents of 1798 also had possession of it for a short time. Pop. '91, 11,500.

WEYER'S CAVE, in Augusta co., Va., is on an offshoot from a branch of the Blue Ridge mountains. It is so called from Bernard Weyer, by whom it was discovered in 1804. It is a stalactite cavern, next in importance to Mammoth and Wyandotte caves. Its largest apartment, Washington's hall, is 250 ft. long, and more than 90 ft. high.

WEYLER, Valeriano, Spanish soldier, b. 1836; served during the Carlist war and against the Moors. Later he held a command in Cuba under Valmaseda, during the rebellion of 1868–78, and is charged with having shown great cruelty toward the insurgents—a charge which he has repeatedly denied, although declaring himself in favor of severity toward the rebels. After serving as captain-general of Catalonia in Spain, he was sent in January, 1896, to take the place of General Campos as captain-general of Cuba. Before starting out he declared that his policy would be to unite liberal political offers with vigorous military measures. For a brief account of the history of the revolt during his term of command, see the article Spain. He was recalled in 1897 and replaced by General Blanco.

WEYMAN, Stanley John, English novelist of the romantic school, was born at Ludlow, Shropshire, August 7, 1855. He was educated at Shrewsbury and Christ Church, Oxford. He read for the bar, was called in 1881, and practiced until 1889, when his first romance was published, *The House of the Wolf* (1890); *The New Rector*, a modern novel, appeared in 1891; *The Story of Francis Cludde* in 1891, and in 1893 he published *A Gentleman of France*, the work which established his fame as a romanticist, and which has been translated into several languages. In 1894 he wrote *The Man in Black*, *Under the Red Robe*, and *My Lady Rotha*, and in 1895 *The Red Cockade*.

WEYMOUTH, a town in Norfolk co., Mass.; on the Weymouth Fore river, and the New York, New Haven, and Hartford railroad; 12 miles s.e. of Boston. It was incorporated in 1635; contains nine villages; and has national, savings, and co-operative banks, electric lights and street railroads, about 15 churches, high school, Tuft's public library, and manufactories of boots, shoes, tacks, boxes and caskets. Pop. '90, 10,866.

WEYMOUTH-and-MELCOMBE-REGIS, a seaport, a fashionable watering-place, and a municipal and parliamentary borough of Dorsetshire, on a bend of the coast facing the s.e., and at the mouth of the river Wey, 4 m. n. of the isle of Portland, and 8 m. s. of Dorchester by railway, 7 in a straight line. A projecting point, called the Nothe, separates the two quarters—the old town of Weymouth lying to the s. of it, the modern town, Melcombe-Regis, extending to the n. and facing the sea. The two quarters communicate by means of a bridge with a swing in the middle, to permit the passage of ships. The old town is uninteresting in appearance; Melcombe-Regis, elegantly built, stands on a narrow peninsula, with the sea on the e., and an estuary on the w. side. Its chief features are the sea-terrace and esplanade, the latter adorned with a statue of George III., who largely patronized Melcombe. The harbor has 14 ft. of water at full tide, and in the bay there is good anchorage in seven or eight fathoms. Portland harbor, recently completed, will be a source of great trade to the town. Weymouth-and-Melcombe-Regis is the seat of traffic to the Channel islands. Pop. '91, 13,769.

WHALE, the popular name of the larger cetaceans, particularly of all those belonging to the families *balænidæ* and *physeteridæ* or *catodontidæ*. The latter family has already been noticed in the article Cachelot, and some of the species of *delphinidæ*, also sometimes called whales, have been described in separate articles, as the Caaing Whale and the Beluga. The *balænidæ* alone remain to be described now. In this family, the head is of enormous size, as in the *catodontidæ*, but is entirely destitute of teeth, instead of which the palate is furnished with an apparatus of *baleen*, or *whalebone*, for the purpose of straining out of the water the small crustaceans and acalephæ, which form the food of these whales. Rudiments of teeth, however—dental pulps—appear in the fetus of the whale—sixty or seventy on each side of each jaw, but they are re-absorbed into the system, and the plates of whalebone are not produced from them but from the integuments.

The fibrous structure of baleen, or *whalebone*, its elasticity, and its heaviness are well-known. The plates of it in the mouth of a whale are very numerous, several hundreds on each side of the mouth, and they are very closely placed together, so that the mouth is filled with them; the whole quantity in the mouth of a large whale sometimes amounting to nearly two tons in weight. They are suspended from the roof of the mouth; none proceed from the lower jaw. They extend on each side from the middle line of the palate, like the barbs of a feather; those in the middle of the mouth are longest. The base of each plate is embedded in the substance of the membrane that covers the palate, while its edge forms a loose fringe, composed of fibres or pliant bristles. The vast mouth being opened, water is taken in; and the small animals which enter with it being retained for food, the water is allowed to escape by the sides of the mouth.

The tongue is a soft thick mass, not extending beyond the back of the mouth. The gullet of whales is very narrow; it is said to be not more than an inch and a half in diameter even in a large whale, so that only very small animals can pass through it. The

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WHALE, ETC.—1. Narwhal or sea-unicorn. 2. Crested Seal. 3. Skull of Greenland wh
10. Skull of seal. 11. Skull of spermaceti whale. 12. Weasel. 13. Common sea

4. Dolphin. 5. Manatee. 6. Wolf. 7. Walrus. 8. Wolverine. 9. Greenland whale. 14. Skull of wolf. 15. Rorqual.

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head of whales occupies from a third to a fourth of the whole length. The skull is unsymmetrical, the right side being larger than the left. The flesh is red, firm, and coarse. The skin is naked, with the exception of a few bristles about the jaws, and its surface is moistened by an oily fluid. The lower surface of the true skin extends into a thick layer of *blubber*, an open network of fibers in which fat is held. The blubber is from a foot to two feet in thickness, the whole mass in a large whale sometimes weighing more than thirty tons, and serves the purpose of keeping the animal warm, as well as of making the specific gravity of the whole body much lighter than it would otherwise be, and of resisting the pressure of the water in the great depths to which it often descends.

The skin of whales is always infested with parasites; mollusks adhere to it; certain kinds of cirrhopods burrow and live in it; and crustaceans, such as the whale-louse, attach themselves to it, and feed upon it.

It has been attempted to calculate the age of whales from the transverse lines on the plates of baleen, and in this way it has been computed that they attain the age of 800 or 900 years, each transverse line being assumed to indicate an annual check of growth. but it is evident that there is no good ground for the assumption on which such calculation proceeds.

In the genus *balæna* there is no dorsal fin, nor elevation of the back corresponding to it, as in some of the family. The belly is smooth, not plaited, as in the other genera of the family. The most important species, and indeed the most important of all the whales, is that known as the RIGHT WHALE, or GREENLAND WHALE (*B. mysticetus*). It inhabits the seas of the northern parts of the world, and abounds chiefly in the arctic regions. It is sometimes seen on the coasts of Britain, and even in more southern latitudes. It attains a size of sixty or seventy feet in length. The body is thickest a little behind the *flippers*, or pectoral fins, tapering conically toward the tail, and slightly toward the head. The tail is five or six feet long, and from twenty to twenty-five feet broad; formed of two diverging lobes, broadest almost where they are united, but with a slight indentation. The pectoral fins are eight or nine feet long, and four or five feet broad. The mouth is fifteen or sixteen feet long. The eyes, which are situated on the sides of the head, about a foot above and rather behind the angels of the mouth, are not larger than those of an ox; but the sense of sight seems to be acute, at least in the water. The iris is white. The blow-holes are situated on the most elevated part of the head; they are from eight to twelve inches long, but of comparatively small breadth. The upper parts are velvety black, the lower parts white. The upper parts, in very old whales, sometimes become piebald, the black being mixed with white and gray. The period of gestation is uncertain; one young one is produced at a birth, and is from ten to fourteen feet in length when born. The mother displays great affection for her offspring, of which whale-fishers sometimes take undue advantage, harpooning the young one—itself of little value—in order to secure the mother. Suckling is performed at the surface of the water, and the mother rolls from side to side, that she and the young one may be able to breathe in turn. The usual rate of progress in swimming is about four or five miles an hour, and whales often swim not far beneath the surface of the water, with the mouth wide open to take in water from which to sift food. The whale is capable, however, of swimming with much greater rapidity, and when harpooned, it often descends to a great depth in a few seconds. Its tail is extremely powerful, and a single blow of it is sufficient to destroy a large boat, or toss it and its crew into the air, so that the whale-fishery is attended with no little danger. Whales usually come to the surface to breathe at intervals of eight or ten minutes, but they are capable of remaining under water for half an hour or more. When they come up to breathe, they generally remain on the surface about two minutes, during which they blow eight or nine times, and then descend. The noise which they make in blowing is very loud, and the spout of spray ejected ascends several yards into the air, appearing at a distance like a puff of smoke. They often assume, as if in sport, a vertical position, with the head down, and flap the surface of the water with the tail, making a sound which is heard two or three miles off. The Greenland whale is not properly gregarious, being generally found alone or in pairs, except when numbers are attracted to particular feeding-grounds, as is sometimes the case in the bays and inlets of northern coasts.

It was formerly supposed that the Greenland whale was an inhabitant of the southern as well as of the northern parts of the world; but the SOUTHERN or CAPE WHALE (*B. australis*) is now regarded as a distinct species, the head being smaller in proportion than that of its northern congener, and the color a uniform black. It attains the length of 50 or 60 feet. It is usually found in comparatively shallow water near coasts. It occurs not only in the colder parts of the southern hemisphere, but throughout its temperate regions, and its range extends into the tropics. It has been taken even as far n. as Japan. Its capture is prosecuted to a considerable extent, particularly on the coasts of south Africa and New Zealand, although this whale-fishery is not nearly so important as that of the northern seas. Several other species of *balæna* have been described, but they are imperfectly ascertained and characterized, specimens not often coming under the observation of competent naturalists in a perfect state. The *nordkaper* of the Icelanders has by some naturalists been described as a distinct species, although it is more generally regarded as a variety of *B. mysticetus*. It differs, however, from the common variety in having the body more slender and the head propor-

tionally smaller; the upper jaw very round, deep and broad; and the plates of baleen comparatively short. It is of a gray color; the lower part of the head of a brilliant white. It is said to be more active and more fierce than the common whale, so that its capture is attended with greater danger.

The species of the genus *megaptera* are called HUMP-BACKED WHALES, and by whale-fishers ordinarily *hump-backs*. They have a rudimentary dorsal fin, in the form of an elevation of the back. There are several species, but some of them are very imperfectly known. *M. longimana*, so called from the length of the pectoral fins, is found in the North sea, and is included in the British fauna. *M. Americana*, the BERMUDA HUMP-BACKED WHALE, occurs chiefly about the Bermudas, from which its baleen is extensively imported. Another species, *M. pæskop*, occurs at the cape of Good Hope.

The genus *balænoptera, physalus*, or *rorqualus* is distinguished by having a dorsal fin. See RORQUAL.

All the species of these genera are objects of pursuit to whale-fishers, although the Greenland whale is that which they prefer.

Important as the whale is to civilized man, both for the oil and the whalebone which it yields, it is still more important to the rude natives of arctic regions, as the Esquimaux and Greenlanders, who use its oil for food as well as for burning, and to whom its flesh also is a chief article of food; while its bones and baleen are used for making tents, sledges, boats, harpoons, and spears; the sinews supply a substitute for twine or thread; and the membranes are used instead of glass for windows. There is no essential difference in the way in which the capture of whales is prosecuted by the rudest tribes and the most civilized nations. The whale-fishers approach the whale in boats, and attack it by harpoons to which lines are affixed, following up and repeating the attack, until its strength is exhausted, taking advantage of the necessity which it experiences of coming at intervals to the surface to breathe, and finally killing it with lances, which are thrust into the most vital parts.

In its most simple form, the harpoon is an iron spear about 5 ft. in length, with a much flattened point, having sharp cutting edges, and two large flattened barbs. Many modifications have been made, the most important perhaps being the gun-harpoon. The ordinary harpoons are attached to a long line at the opposite end to the barbed point, and when the boat is near enough to the whale, the man whose duty it is darts or plunges the weapon with all his force into the animal's side. In its fleeing from the attack, the line is rapidly drawn out of the boat, until the creature is tired, and rises to the surface for air. The boat follows, keeping as much of the line as possible, until, exhausted by pain and loss of blood, the animal succumbs. It will be seen that much depends upon the sharpness of the blade-like edges of the barbs, and their power to hold when in; hence many ingenious devices of movable barbs have been contrived, which close on the shaft of the instrument in going into the animal's flesh, but open outward as soon as there is any strain on the shaft. The gun-harpoon is a short bar of iron with the barbed spear at the end, and a ring with chain for the attachment of the line; this is fired from a small swivel cannon attached to the whaler's boat. However well the harpoon may be fixed in the animal's body, its death and capture are still very difficult matters to accomplish, and take much time. To obviate this, a very ingenious expedient was suggested by sir R. Christison, the eminent toxicologist of Edinburgh university, that glass tubes containing prussic acid should be so placed in the shaft of the harpoon that the moment the cord or line was pulled tight they would be broken in the animal's body, and occasion instant death. This plan has been tried with great success, but has met with opposition from the whale-fishers, who have a prejudice against using a poison which they see has such deadly effects. Another mode of employing prussic acid is to inclose a glass tube containing it, in a hollow rifle bullet about 4 in. long, which is fired from a rifle made for the purpose, the bullet containing also an explosive substance connected with a fuse, which is kindled as the rifle is fired, so that the bullet bursts immediately after penetrating the whale, and spreads its deadly contents through the flesh. The bullet is made of zinc, because it breaks into fragments more angular than any other metal. The success of this method has been found to be perfect, but sailors object to its use, dreading to touch the carcass of a whale which has been killed by so powerful a poison, for a whale struck by a bullet charged with prussic acid only disappears for about five minutes, and rises to the surface dead. Strychnia has been used instead of prussic acid, and with similar results.

The lance used for killing the whale has generally a blade 5 or 6 in. long, and 2½ or 3 in. broad, with sharp cutting edges, and a long wooden handle.

The ships fitted out for the northern whale-fishery are generally screw-steamers, of from 400 to 600 tons burden. To protect them from injury by ice, they are fortified with an additional series of planks, iron plates, and a *false* or *ice* stem, on the sides of which are *ice-knees*—angular blocks of wood filling up the concavity formed by the stem and fore-planks. The stern is also defended by *ice-plates* of half-inch iron; and many timbers and stanchions are added in the interior of the vessel, great strength being a more important requisite than fast sailing. Each ship has generally six or seven boats, *carvel-built*, from 23 to 28 ft. in length, each capable of carry 6 or 7 men, with 7 or 8 cwt. of whale-lines, etc. The crew of a whaler consists of 40 or 50 men, each of whom, from the master to the boys, generally receives, in addition to his fixed wages, a gratuity

for every whale caught, and a certain sum for every ton of oil produced by the cargo. Each boat carries 2 harpoons and 6 or 8 lances. When the ship arrives in the vicinity of a whaling-ground, a look-out is stationed at the mast-head. As soon as a whale is discovered, the boats are lowered, and a competition ensues among their crews, all exerting their utmost strength to reach the whale first. The harpooner is ready, as soon as the boat is sufficiently near the whale, to hurl his harpoon with all his force; the crew instantly back the boat, and the whale generally plunges in terror to a great depth, sometime carring out more than 200 fathoms of line. It remains below for 20 minutes or more, and when it rises, the boats hasten to it again; it is stuck with a second harpoon, and probably, instead of at once descending, it strikes violently with its tail, to destroy its enemies, when great caution is requisite. It cannot now remain long below the surface, and when it comes up, probably spouts blood through the blowholes. When it is lanced, it sometimes dies almost at once, but sometimes there is a terrific struggle—the water is lashed into foam, and dyed with blood. It not unfrequently happens that instead of dying at the surface of the water, the whale descends, and does not rise again, so that it is lost to the whaler. The carcass of the whale is towed by the boats to the ship, and made fast to the ship's chains. The process of *flensing* is then commenced. Some of the crew, having their boots armed with iron spikes, to prevent them from slipping, descend upon the carcass, and cut into the blubber with *blubber-spades*, removing a broad strip or *blanket* of skin, 20 or 30 ft. long, which is hoisted to the deck by means of a hook and tackle. Great cubical pieces of blubber, of half a ton or a ton in weight, are then cut out, and hoisted on deck. In this way, the process is carried on, the whale being turned over and over, that every part may be reached; till in three or four hours, the whole mass of blubber is removed from it—probably amounting to 20 or 30 tons. Meanwhile others of the crew have descended into the mouth of the whale, and removed the baleen. The remainder of the carcass is then flung adrift, and sometimes sinks, but often swims, in consequence of incipient putrefaction, to afford food for bears and fishes. The blubber, after being received on deck, is cut into smaller cubical pieces, and subjected at leisure to a process by which the cellular tissue is separated from it. This is called *making-off* or *trying out;* and to accomplish it, the blubber is heated in a large pot, and afterward strained, the scraps or cracknels from one pot serving as fuel for another, and the ship being made filthy with smoke, soot, and grease. The product is finally stored in casks, to be conveyed home, and boiled for oil. A ton of blubber yields nearly 200 gallons of oil. A single whale often yields blubber and whalebone to the value of $3500 or $4000.

The Norwegians sent vessels to Greenland for the whale-fishery in the 9th century. They had previously prosecuted it on their own coasts, and the Norman settlers on the bay of Biscay carried it on there, whales inhabiting that bay in considerable numbers, till, through the eager prosecution of the fishery, they became so few that about the 15th c. it became unprofitable, and was relinquished. In 1261 a tithe was laid upon the tongues of whales brought into Bayonne, they being then highly esteemed for food. The French, Spaniards, and Flemings early began to fit out vessels for the northern whale-fishery; the English entered upon it with great spirit in the end of the 16th c., and about the same time the Dutch, Danes, and Hamburgers. The British Muscovy company obtained a royal charter, giving them a monopoly of the whale-fishery of the coasts of Spitzbergen, on the pretense of its having been discovered by sir Hugh Willoughby, although, in fact, it was discovered by the Dutch navigator Barentz. Other nations were not disposed to acknowledge the claims of the English; the Dutch in particular sent out a strong fleet, between which and the ships of the Muscovy company an engagement took place in 1618 and the English were defeated. The Spitzbergen bays and seas were afterward divided into fishing-stations, allocated to the whalers of the rival nations. No nation now asserts a claim to the exclusive right of whale-fishing in any quarter.

The English for some time prosecuted the whale-fishery sluggishly and with incompetent means; the Dutch carried it on with great vigor and success. During the latter half of the 17th c. the Dutch furnished almost all Europe with oil. In 1680 they had 260 ships and about 14,000 men employed in the whale-fishery; but from that time the Dutch fishery began to decline. In 1732 Great Britain attempted to encourage the whale-fishery by a bounty of 30s. a ton to every ship of 200 tons engaged it it, which was raised in 1749 to 40s., reduced to 30s. in 1777, and again raised to 40s. in 1781. The object of the bounty was not only to encourage the trade, but to make it a nursery for seamen. Ships, however, were fitted out rather for the bounty than for the capture of whales, and during the next five years after the reduction of the bounty in 1777 the number of ships employed in the trade was reduced from 105 to 39. After 1781 it rapidly increased, and continued to increase although the bounty was reduced. The bounty was finally altogether withdrawn in 1824; yet in 1815, when the British whale-fishery was in its most flourishing condition, only 164 ships were engaged in it. The Dutch whale-fishery had in the meantime almost entirely ceased, owing to the national calamities consequent on the French revolution. The British whale-fishery is still prosecuted, although not nearly to the extent that it was fifty years ago. The French whale-fishery has in like manner declined. The Americans are at present more actively engaged in the whale-fishery than any other nation. The New England colonies entered upon this enterprise at a very early period, at first merely by boats on their own coasts, which, however, were deserted by whales before the middle of the 18th c., and ships then began to be fitted out for the

northern seas. For a number of years, however, the American whale-fishery also has been declining, owing to the scarcity of whales, and because substitutes for whale-oil and whalebone have been found. New Bedford, Massachusetts, is the greatest whaling-port in the world.

WHALEBACK. The name of a new type of freight-steamer which discards masts and sails, and, instead of bulwarks, has sides rounded, so that waves in striking take no hold. Whalebacks were developed from barges of similar shape used on the great lakes, and known as "pigs." In 1891, the first whaleback built for ocean traffic made a voyage to Liverpool, where it attracted great interest. This was the *Charles W. Wetmore*, built on Lake Superior, with a length of 265 ft., beam 35 ft., depth 24 ft., register 1075 tons, and with a freight capacity of 3000 tons. She makes 10 knots per hour, and burns only 12 tons of coal a day. It is said that the whalebacks are much steadier in a storm than steam vessels of the ordinary type, while the cost of building is one third less. So slight is the motion of a whaleback in an ordinary sea, that it is said that when the hatches on the *Wetmore* were removed in Liverpool, the footprints of the men who had been engaged in lading it at New York were still visible in the grain.

WHALEBONE. The baleen plates which take the place of teeth in the mouths of the baleen whales (see WHALE), constitute the whalebone of commerce. They vary in length from a few inches up to ten, and even in rare instances 12 feet. Their chemical constitution is albumen hardened by a small proportion of phosphate of lime. Their color is usually of a bluish black, but in some species they are striped longitudinally with bands of a whitish color; and they terminate at the point in a number of coarse black fibers of the baleen, which fibers are also found more or less down both sides of the blade. These fibers are much used by brushmakers. There are three principal kinds in the market, and they are generally known as *whale-fins*. The first is the *Greenland*, or Davis's strait and North sea fins; second, the South sea, or black fish-fins; third, the n.w. coast, or American whale fins. Whalebone requires some preparation before being fit for use; this, however, is very simple. It is first trimmed—that is, all the hairs are removed from the point and edges of each blade; and generally the surface of each flat side is scraped. The blades are then boiled in water for several hours, until they become soft enough to be cut easily with a common knife. The workman then cuts them into lengths fitted for the purposes to which they are to be applied. They are chiefly used in thin strips, such as stay-bones and umbrella-ribs, and can be easily split for such purposes, owing to their lamellar structure. Generally the boiling is combined with a dyeing process, to make the whalebone perfectly black.

WHANG-HAI', or YELLOW SEA, an important inlet of the Pacific ocean, washes the n. part of the e. coast of China, and is bounded on the w. by the Chinese provinces of Shang-tung and Keangsu, on the e. by the peninsula of the Corea and Japan. It terminates on the n.w. in the gulfs of Pe-chih-li and Leao-tong, and opens out in the s.e. into the Tung-hai or Eastern sea. It is more than 600 m. long, and over 400 m. in average breadth. Near the land its waters are of a lemon color, owing to the yellow sand brought down by the river Whang-ho, which empties into it.

WHANG-HO, HOANG-HO, or YELLOW RIVER, one of the principal rivers of China, about 2,900 m. in length, and the area of its basin being not less than 700,000 sq. miles. It rises in a marshy plain lying between the Bayan-kara and Kwanlun mountains, in a lake called Ala-nor, in lat. 35° 30′ n., long. 95° 30′ e. Its course is so crooked that after it leaves Ala-nor, it turns first s. 30 m., then e. 160, then westward 120, winding about the gorges of the Kwanlun, then n.e. into the province of Kansuh, next it proceeds northward for 430 m., till it is bent eastward by Inshan, on the edge of the table-land, where it incloses within its great bend the country of the Ortous Mongols. At the Peh-ling it is deflected s. where it divides the provinces of Shanse and Shense for 500 miles. At the south-western corner of Shanse, it receives its largest tributary, the Wei-ho, 400 m. in length. In some parts of its eastern course it is above the great plain through which it passes. The embankments requisite for averting inundations are a source of never-ending expense to the government, and their yielding to floods a frequent cause of desolation to extensive districts of country. Dr. Macgowan announced some years ago, in the *North China Herald*, that this wayward and turbulent stream had suddenly shifted its course, turning off near Kaifung-foo in a north-easterly direction, discharging its waters into the rivers of Chihle, which disembogue in the gulf of Pehchele, the mountainous province and promontory of Shantung intervening between its former and its present mouth, a distance by coast-line of about 500 miles. More recently, it was announced that the old bed of the Yellow river, for more than 200 m. from its mouth, was a belt of sand, which, since 1853, has been, to use the Chinese term applied to it, "as dry as dust." The change seems to have been gradual.

WHARF—WHARFINGER. The space along a harbor or navigable stream, arranged to receive a vessel's cargo, is called a wharf. It is usually built out beyond the lowest ebb of the tide, so that vessels may come up along-side, and discharge or receive cargo. A wharf is commonly built by driving down piles and covering them with plank. At common law, the soil of tide-waters below high-water mark belonged to the crown; in this country it belongs to the states, who have the power of regulating the erection and use of wharves. A wharf built without the sanction of the state, is a pub-

lic nuisance. But the right may be granted to others; thus, the shore of Manhattan island has been ceded to the city of New York by the state of New York. The person who is the owner or keeper of a wharf is called a WHARFINGER. His liability is that of an ordinary bailee for hire. His charges for landing or loading goods are called wharfage. Being matters of public interest, wharfage rates can be regulated by statute. A wharfinger has a lien on the goods for his balance.

WHARTON, a co. in s.e. Texas, having the San Bernard river on the n.e., drained by the Colorado; 1100 sq.m.; pop. '90, 7584, chiefly of American birth, inclu. colored. Co. seat, Wharton.

WHARTON, FRANCIS, D.D., LL.D., b. Philadelphia, 1820; graduated, Yale college, 1839; practiced law, Philadelphia; prof. of logic and rhetoric in Kenyon college, Ohio, 1856–63; rector of St. Paul's church (Prot. Episcopal), Brookline, Mass., 1863; prof. in Cambridge Episcopal seminary, 1866; editor of *Episcopal Recorder.* He published a *Treatise on the Criminal Law of the United States; Treatise on Medical Jurisprudence; State Trials of the United States during the Administrations of Washington and Adams; Treatise on the Law of Homicide in the United States; Treatise on Theism and Modern Skepticism.* He contributed to many periodicals, and edited volumes of law reports. He d. 1889.

WHARTON, HENRY, 1664–95, b. Norfolk, England; graduated at Cambridge university, 1684. He took orders in the church of England and was assistant to Cave in the compilation of the *Scriptorum Ecclesiasticorum Historia Literaria* (1688). He also wrote several biographical and theological works, the best known of which is *Anglia Sacra.*

WHARTON, PHILIP WHARTON, Duke of, was the son of Thomas, marquis of Wharton, an eminent member of the whig party in queen Anne's reign, and lord-lieutenant of Ireland from 1708 until after the fall of the Godolphin administration in 1710. Macaulay says he was licentious and corrupt; but the faults of his Irish administration were largely redeemed by his appointment of Addison as chief-secretary. George I. made him lord-privy seal and marquis of Wharton in 1715, but he died three months afterward. His son, Philip, born 1698, was educated at home by his father, who aimed at making him a great orator, a whig in politics, and a Presbyterian in religion. In a boyish freak, he contracted a clandestine marriage at the Fleet with the daughter of Maj-Gen. Holmes. The shock is said to have killed both his parents. Wharton soon parted from his wife, and in 1716 went abroad with a French Huguenot tutor, to be brought up according to his father's dying instructions, in strict Presbyterian principles, at Geneva. He contracted debts, spurned the restraints of his tutor, and ran away to Lyons. He visited the pretender at Avignon, and, it is said, accepted from him the title of duke of Northumberland. He next visited Paris, and, after various extravagances, set out for Ireland, where, although he had not yet reached his 19th year, he was allowed to take his seat in the house of peers. He soon displayed such splendid abilities in debate, and supported the government with so much zeal, that, although still under age, he was, Jan. 20, 1718, raised to the highest rank in the English peerage. He did not take his seat in the English house of peers until 1720. Here he opposed with much warmth the government measure on the South sea bill, and the bill of pains and penalties against bishop Atterbury. His affairs became hopelessly involved by his extravagance, so that although he had succeeded to an estate of £16,000 a year, he was soon compelled to accept a yearly allowance of £1,200 from his creditors. He set up a political paper, called the *True Briton,* in 1723; and lost no occasion of speaking, as well as writing, against the ministry and the court. In 1724 he set out for Vienna, and then visited Madrid, where he was served with an order from the privy seal to return home. He treated the order with contempt, and afterward went to Rome, and appeared openly at the court of the pretender, from whom he accepted the order of the garter. He now assumed the title of duke of Northumberland. In 1727 he fought with the Spaniards and against his countrymen at the siege of Gibraltar. This last mad act lost him his English title and estates, and led to his conviction under a bill of indictment for high treason. He refused to make his submission to the government; and the rest of his life was passed in France and Spain, at one moment squandering his precarious supplies of money in drunkenness and luxury, and at another suffering the extremest poverty. He died in a miserable condition at a Bernardine convent in Catalonia, May 31, 1731. His brilliant talents and wasted life were sketched by Pope in his Moral Essays, in the lines beginning—

Wharton, the scorn and wonder of our days.

The *Life and Writings of Philip, late Duke of Wharton,* were published in 1732 (Lond. 3 vols. 8vo); and another two-volume publication, entitled *The Poetical Works of Philip, late Duke of Wharton, and of the Duke's Intimate Acquaintance,* appears, with the exception of the title-page and a prefixed biography of Wharton, to have been printed in 1727. This publication, however, contains little that is even attributed to the duke.

WHATCOM, a co. in n.w. Washington, having the gulf of Georgia for its w. boundary, drained by the Skagit river, containing mount Baker, a peak of the Cascade range, 10,827 ft. in altitude; 2468 sq. m.; pop. '90, 18,591, chiefly of American birth; with colored. Co. seat, New Whatcom.

WHATELY, Richard, Archbishop of Dublin, was born in Cavendish square, London, Feb. 1, 1787, and was the fourth son of Dr. Joseph Whately of Nonsuch park, Surrey, prebendary of Bristol, vicar of Widford, and lecturer at Gresham college. He was sent in due time to a private school at Bristol, from which, in 1805, he passed to Oriel college, Oxford. He took his bachelor's degree in 1808, taking a second class both in classics and in mathematics. He got the English-essay prize in 1810. In the following year he was elected a fellow of Oriel college, which at that time ranked among its fellows not a few men destined to play a considerable part in the world, and already remarkable for their attainments and intellectual activity—e.g., Arnold, Keble, Pusey, and the elder Newman. In 1815 he became one of the tutors of his college; and about this time he wrote (originally for the *Encyclopædia Metropolitana*) what he afterward expanded into his popular treatises on logic and rhetoric. In 1821 he married a daughter of W. Pope, esq., of Hillingdon, Middlesex. In the same year he published two works; the one a volume of sermons on *The Christian's Duty with respect to the Established Government and the Laws;* the other a work which is among the most celebrated and characteristic of his writings: this was *Historic Doubts relative to Napoleon Bonaparte.* Its object was to throw ridicule upon the criticism to which the Gospel narratives were subjected by skeptical writers, by applying the same kind of criticism to events within the memory of all the world, and starting doubts as to whether these events had occurred. This *jeu d'esprit* with a purpose created a great sensation. It has been translated into several foreign languages. In 1822, Whately was presented to the living of Halesworth, in Suffolk. In the same year he delivered the Bampton lectures at Oxford, taking for his subject the "Use and Abuse of Party Feeling in religion." In 1825 he was oppointed by lord Grenville principal of St. Alban's hall, which, under his energetic rule, quickly lost the bad character it had long sustained in the university. In 1829 he was appointed professor of political economy; but he was destined not to hold this office long enough to do more than deliver an introductory course of lectures. In 1831 lord Grey's government, at the instance of lord Brougham, appointed him archbishop of Dublin and bishop of Glendallach. Afterward, in 1846, his episcopal charge was enlarged by the addition of the bishopric of Kildare.

During the ten years preceding his appointment to the archbishopric, Whately had been incessantly writing and publishing, chiefly upon theological and ecclesiastical subjects. He belonged to the liberal school in religion and in politics; he was opposed, that is, to high church or Catholic views in theology, and to toryism in politics. He had taken a keen interest in the political questions of the time, and especially had made himself conspicuous in the university by his advocacy of Catholic emancipation, of which the party in the church which had most sympathy with the theology and ecclesiastical system of the Roman church were the most determined opponents. When sir R. Peel, after his change of views on the emancipation question, voluntarily submitted himself for re-election to the university, Whately, though a liberal, came forward to support him, and was one of the most active of those who endeavored to prevent his rejection. His *Essays on some of the Peculiarities of the Christian Religion* appeared in 1825; his *Elements of Logic,* in 1826; the *Elements of Rhetoric,* in 1828; his *Essays on some of the Difficulties in the Writings of St. Paul,* etc., also in 1828; his *Thoughts on the Sabbath,* in 1830; and in the same year, the *Errors of Romanism traced to their Origin in Human Nature.* His *Introductory Lectures on Political Economy* were published in 1831. By this time his writings, and the great activity and ability which he displayed in his various public functions, had placed him among the foremost men of the university, and had also got him rank among the most remarkable thinkers and writers of his time. Though many distrusted him as a liberal, questioned the soundness of some parts of his theology, or thought his manners too eccentric, and his habit of mind too peculiar, for one who was to rule over others, nobody questioned that his abilities and reputation were equal to the high position bestowed upon him by lord Grey.

As archbishop of Dublin, Whately was very active in all matters of importance, social and ecclesiastical, and showed a deep interest in every question affecting the welfare of Ireland. He was one of the original members of the board of national education, and continued a member till 1853, when he retired, in consequence of a departure, as he thought, having been made from the principles on which, up to that time, the national education had been carried on. He was perhaps the most active member of the board, and the success of the national system was in a great measure owing to him. He and members of his family were always foremost in supporting well-devised charitable schemes. His liberality was, in fact, unbounded, though an opposite impression prevailed among those who did not known him, because he wrote and spoke strongly against casual benevolence, and used to say he had never given a penny to a beggar. As archbishop, his rule was firm and judicious. A slight disregard of etiquette was about the worst thing ever alleged against him: he was not disposed to make much difference between a rector and his curate. His activity as an author was not stifled by his energetic discharge of his public duties; indeed, he seems to have been always either writing a book, or affording literary help to others. Besides many charges, sermons, and a few pamphlets, his *Kingdom of Christ Delineated,* one of the most remarkable of his works; his *Introductory Lectures to the Study of St. Paul's Epistles;* his *English Synonyms;* and his annotated edition of Bacon's *Essays*—perhaps the best example of good editing in the English

language—belong to this period of his life. A work published anonymously in 1855, *Scripture Revelations respecting Good and Bad Angels*, has been generally ascribed to Whately.

He died on Oct. 8, 1863. The world's esteem and the regard of his friends for him had been growing to the last. In early life, there was much about him to shock the fastidious, and some things which might hurt the sensitive; but his peculiarities softened and wore off as he advanced in years. At Oxford he was noted for his rough unceremonious manners, for which (together with his dress) he was nicknamed the white bear; and for the plain speaking and rough ridicule with which he would overwhelm an opponent in an argument. He was remarkable, too, for his fondness for athletic sports, which he indulged with a perfect indifference to the minor proprieties. He used to say that his abrupt and careless and seemingly unfeeling ways were a recoil from the painful shyness for which he had been remarkable in his youth. Those who knew him, however, made light of his peculiarities; and few things about him are more pleasing than his firm belief in the merits of his friends, and the number, the warmth, and the permanence of his friendships. He had great talents for conversation, and was famous for his bon-mots, happy repartees, and conversational pleasantries of every kind. His writings are not so much remarkable for subtlety of thought or novelty of view as for strong logic, acuteness, felicity of arrangement and exposition, and the frequency and homely force of his illustrations. He had the happy power of building up materials which might be old into a new, commodious, and almost a beautiful structure. He did nothing for mere ornament's sake: though his imagination was abundantly fertile, it was used only to illuminate his argument; his images are seldom impressive for their beauty, though admirably fitted for didactic purposes. His theological works have been charged with a "cold rationalistic" tendency, and with being wanting in reverence; and it has been inferred, though perhaps too hastily, from some passages in his writings, that he was heretical on the subject of the Trinity. The *Historic Doubts*, the *Essays on the Peculiarities of the Christian Religion*, the *Errors of Romanism*, and the *Kingdom of Christ*, are perhaps the most valuable and characteristic of his writings.—The *Life and Correspondence of R. Whately, D.D., etc.*, by his daughter, E. Jane Whately, was published at London in 1866. It is an interesting, though in some respects a partial, and in some degree an inadequate, memorial of Dr. Whately. As might be expected, the "white bear" side of his character is kept in the shade: but few examples are given of the coarse but racy conversational wit which was one of the archbishop's claims to distinction among his contemporaries. And it is scarcely possible to gather from it what his exact position was in theology or in literature, though the letters which form a great part of it, give a very fine impression of the qualities which distinguish his works.

WHEAT, the most valuable, and, next to maize, the most productive of all the cereal grasses. The genus *triticum*, of which the species are popularly known either as *wheat* or *wheat-grass*, is distinguished by a spike with many-flowered spikelets, without stalks, and seated one on each notch of the rachis, their sides directed to the rachis, which is zigzag; and two glumes, of which the lower is either awned or awnless; the outer paleæ of each floret having at the top a notch, in the center of which is the terminal point, sometimes prolonged into an awn, or, in some species, with many florets tapering into an awn without a notch. A number of species are found in Britain, of which *T. repens*, well known as couch grass (q.v.), is the most common; but the seeds of none of them are of any value. The native country of the cultivated wheat has generally been supposed to be the central part of Asia; but a discovery was made not many years ago by M. Fabre of Agde, in the s. of France, that the *ægilops ovata*, a grass of the regions near the Mediterranean, and of the w. of Asia, becomes transformed by cultivation into wheat. The announcement of this discovery was at first received with much doubt, although the possibility of the transformation had been suggested by previous botanists; but it has been confirmed by subsequent observations and experiments. The genus *ægilops*, as hitherto recognized by botanists, is distinguished from *triticum* chiefly by its more numerous awns, the glumes of *Æ. ovata* being generally terminated by 3 or 4 awns, prolongations of their ribs, and the *paleæ* by 2 or 3 short awns. The awns of grasses, however, afford very uncertain characters, being extremely liable to disappear through change of circumstances; and among the cultivated varieties of wheat, every farmer is familiar with some that are awned or *bearded*, and some that are beardless, having scarcely a trace of awn. In the wild *ægilops*, the ear is also much more easily broken from the rachis than in wheat. In cultivation, the *Æ. ovata* very soon loses the awns of its paleæ and of the lateral ribs of its glumes, and thus assumes the characters of wheat, the ears at the same time losing their fragility, the grain also increasing in size, while the floral envelopes are proportionaly diminished, the leaves become larger, and the stem stronger. From seeds of the *Æ. ovata* sown in a garden in 1838, M. Fabre obtained wheat of fair quality in 1846. Prof. Buckman, of the royal agricultural college, repeated the experiment in England. His first sowing was in 1855, and notwithstanding the disadvantages of cold seasons and a cold situation on the Coteswold hills, he found the spikelets much modified in 1859, the warm summer of that year producing a greater change than had taken place in previous years (see *Popular Science Review* for October, 1861). The identity of the principal cultivated forms of *triticum*

with *Æ. ovata* may now be regarded as fully established. These forms have generally been included by botanists under the name *T. vulgare.*

Wheat has been cultivated from the earliest ages, and was a chief crop in ancient Egypt and Palestine, as it still is in all the temperate parts of Europe, Asia, and Africa. It is cultivated to a considerable extent in the n. of India. In North America it is very extensively cultivated, and many parts of the United States and British provinces are admirably adapted to it. Wide regions of South America are equally suitable, and wheat of the finest quality is produced in Australia. In the torrid zone, wheat does not succeed, except in elevated situations; but it nowhere succeeds better than in sub-tropical regions, although it is a hardy plant, and when covered by snow, endures even very severe winters in the n. of Europe. For its successful cultivation, however, it requires a mean temperature of at least 55° Fahr. for 3 or 4 months of the year. It is an annual plant, and its capacity of enduring the cold of winter is of importance only in connection with the advantage to be derived from sowing in autumn, so as to have it more forward in spring. Its cultivation does not extend so far n. as that of barley or oats, or even of rye. In Europe, its northern limit is about lat. 60°. The quality of the grain varies much in different soils and climates, and particular varieties are also distinguished by difference of quality as well as by external characters. The wheat of the eastern parts of Britain, where the climate is comparatively dry, is superior to that of the western parts, where the sky is more cloudy and the climate more humid, although the crops in the west are not less luxuriant; and the wheat produced in Britain is not found suitable for the manufacture of macaroni, to which that of the countries near the Mediterranean is particularly adapted. Although hardy in winter and early spring, wheat becomes more delicate and susceptible of climatic influences as it advances in growth; a prevalence of dry weather, with bright sunshine from the time when it comes into ear until it is ripe, is of the greatest importance.

Common Wheat, *T. vulgare, æstivum,* or *sativum,* grows to a height generally of 3 or 4 ft., and has ears or spikes generally 3 or 4 in. long; the spike 4-cornered, the spikelets about 4-flowered; the paleæ ventricose, ovate, truncate, mucronate or awned, compressed under the point, rounded at the back, the grain free. In consequence of long cultivation, in a great variety of climates, the cultivated varieties of wheat are very numerous, more so than in any other kind of grain. New varieties are continually coming into notice; and many are in high estimation in particular districts, although little known beyond them. Some botanists have attempted to distinguish species among them, appropriating the name *T. æstivum* to the awnless kinds, and *T. hybernum* to the awned; but intermediate forms are very numerous, and the length or shortness of the awn seems to depend upon accidental circumstances. Nor do the awnless or beardless kinds perfectly correspond with the summer wheat of farmers, preferred for sowing in spring with a view to a crop in the same season, and the awned or bearded kinds to the winter wheat, sown in autumn, as some of the hardy varieties of winter wheat are awnless, and some of those usually sown in spring are bearded. Besides being classified as bearded and beardless, the varieties in cultivation are also distinguished according to the color of the grain, as *white* and *red* wheats. Some having the ears covered with a short soft down are known as *woolly* wheats. There are also differences in the length and compactness of the spike, and in the size and form of the grain, which is more rounded in some, and more elongated in others. A number of varieties, having the spike very compact or square, have been sometimes classed together under the name of *T. compactum,* and the distinction is very obvious and permanent, although there is no reason for regarding it as characterizing a distinct species. Akin to this is the Mummy Wheat (*T. compositum*), in which the spike is branched, and which is said, but on insufficient evidence, to have been produced from seeds found in mummy-cases in Egypt. Mummy wheat has been grown in England, of which the ears have had 10 or 11 branches, and 150 grains have been found in one ear; while 60 ears have been produced by a single seed. Notwithstanding these apparent advantages, however, this variety does not serve the purposes of the farmer so well as some others. In another group of varieties with compact ears (*T. turgidum* of some botanists), the glumes are remarkably tumid, and always awned. These are known by the names of gray wheat, Pollard wheat, duckbill wheat, etc., and in Germany are commonly called English wheat. Polonian wheat (*T. Polonicum*) is the common name of a number of kinds of a very peculiar appearance, with a long, loose, and somewhat nodding spike; the glumes awned, and remarkably long—twice the length of the florets. The stems are also very tall, sometimes more than 6 ft. high. These kinds, sometimes called *Grecian* or Mogadore Wheat, are cultivated in some parts of the s. of Europe, in the s. of Siberia, and in Africa. Hard Wheat, or Horny Wheat (*T. durum*), has rather small, elongated, and very hard grains, the paleæ have remarkably long awns, and the leaves are very broad. It is much cultivated in the countries near the Mediterranean, and Dr. Royle suggests that it would be a valuable acquisition to India, as it yields a good crop on comparatively sterile soils.

The red varieties of wheat are generally more hardy than the white; the grain is inferior in quality, and yields less flour, but these disadvantages are more than counterbalanced in many soils and situations by the greater productiveness of the crop. Red wheats are therefore preferred for comparatively poor soils, but the white kinds are gen

erally cultivated wherever the soil and climate are suitable. The varieties with long straw yield the best crops in dry seasons, but the short-strawed kinds are best when the season is wet. Wheat is particularly suited to clay soils, and rich heavy loams; but with good farming, excellent crops are produced even on light sandy or gravelly, and on chalky soils. Where the climate is moist, a light dry soil is most suitable; soft deep soils being productive chiefly of straw. The land intended for wheat must, at least in Britain, be in a high state of cultivation. Wheat is commonly sown after green crops, beans, or bare fallow; in the s. of England, often after grass or clover. It may be sown, at least in autumn or the beginning of winter, when the ground is so saturated with moisture, that any other kind of grain would be almost sure to perish. It is either sown broadcast or in drills, and the practice of drilling becomes more and more prevalent, both on account of the saving of seed and the superiority of the crops produced. The land prepared for wheat is very often manured with farm-yard manure; artificial manures —as guano—are also used. In Scotland, it is a common practice, when wheat is to be grown after turnips, to plow down the turnip-leaves in autumn before the wheat is sown, and to apply guano in spring. Nitrate of soda is another favorite top-dressing for wheat, but sometimes causes the plants to grow too rapidly, so that they become tender, and suffer from climatic influences. Many farmers use both guano and nitrate of soda for top-dressing wheat, and the nitrate of soda is often mixed with common salt, which is thought to be useful in giving strength and vigor to the wheat plants, preventing *lodging* and mildew. Wheat ought to be reaped before it is *dead ripe*, unless when it is intended for seed, and it ought to be stacked as soon as it is sufficiently dry to be free from danger of heating. On very rich land wheat sometimes becomes too luxuriant in spring, and its growth needs to be repressed by cutting the leaves with a scythe—a practice essentially agreeing with that mentioned by Virgil in his *Georgics* (i. 111), of allowing cattle to feed upon the young blades:

> Quid, qui, ne gravidis procumbat culmus aristis,
> Luxuriem segetum tenerâ depascit in herbâ,
> Quum primùm sulcos æquant sata?

The relative proportions of straw and grain differ very much in different varieties of wheat, and according to differences of soil, climate, and season. The proportion of the weight of grain to that of the whole plant when dried so as to be ready for stacking, varies from 20 to 47 per cent. The composition of the grain itself varies considerably, as to the proportions of starch, gluten, etc., which it contains. One hundred parts of the grain of wheat, dried in the ordinary manner, contain on an average—water, 14.83; gluten, 19.64; albumen, 0.95; starch, 45.99; gum, 1.52; sugar, 1.50; oil, 0.87; vegetable fiber, 12.34; ash, 2.36; total, 100.00.

The ash is rich in phosphoric acid, magnesia, and potash. Its composition is as follows: Potash, 29.97; soda, 3.90; magnesia, 12.30; lime, 3.40; phosphoric acid, 46.00; sulphuric acid, 0.33; silica, 3.35; peroxide of iron, 0.79; chloride of sodium, 0.09; total, 100.00. For the processes by which starch and gluten are obtained from wheat, see these articles.

The value of wheat depends mainly on the quantity of fine flour which it yields; the best wheat yielding 76 to 80 per cent, sometimes even 86 per cent, of fine flour, whereas inferior kinds seldom yield more than 68 per cent, and sometimes only 54 to 56 per cent. In general, the smoother and thinner the grain is in skin, the greater is the produce of fine flour. The greater part of the husk of wheat is separated from the flour by the miller, and is known as *bran*. That portion of the bran which is more finely divided than the rest receives the name of *sharps* or *pollard*. See the articles Bran and Flour.

Wheat-straw contains, on an average, in its ordinary state of dryness—nitrogenous substances, 1.85; non-nitrogenous substances, 67.56; mineral substances, 4.59; water, 26.00; total, 100.00; and the composition of the ash is as follows: Potash, 12.14; soda, 0.60; magnesia, 2.74; lime, 6.23; phosphoric acid, 5.43; sulphuric acid, 3.88; silica, 67.88; peroxide of iron, 0.74; chloride of sodium, 0.22; total, 100.00.

The principal diseases to which wheat is subject, some of which are often productive of great loss to the farmer, are either owing to or connected with the presence of parasitic fungi. See Bunt, Mildew, Rust, and Smut. An animalcule causes the disease known as ear-cockles (q.v.). Wheat suffers also from the ravages of numerous species of insects.—See Hessian Fly, Wheat-fly, Corn-moth, and Wireworm. The larva of a ground beetle (*zabrus gibbus*) is often very destructive to young wheat in winter and spring.

Spelt (*triticum spelta*) is regarded as a distinct species from common wheat, and is supposed to be a cultivated form of *ægilops caudata*, a native of the countries near the Mediterranean. The spikelets are smaller than in common wheat, and each spikelet has two or three, rarely four, perfect florets, besides a barren terminal one; the outer glumes and the paleæ are very broadly truncate at the top, and notched; the awns very slender; the ripened grain adheres closely to the paleæ or chaff. Spelt is supposed to be the grain called *zea* by the Greeks and *far* by the Romans. It is of little value in comparison with wheat, but can be grown on inferior soils, and is cultivated in Switzerland, at an elevation where wheat would not succeed. The bread made of it is coarse, and is used chiefly by the poorer classes.—Another species sometimes called Lesser Spelt, or One-Grained Wheat (*triticum monococcum*), is also occasionally cultivated on poor soils, and in elevated situations in the center and s. of Europe. It is sometimes called

St. Peter's corn." The ear is small and compressed, the spikelets contain only one perfect flóret and a rudimentary one; the awns are long; the grain is small, and adheres closely to the chaff.—*Triticum Bengalense* may be regarded as a kind of spelt. It has remote spikelets, long awns, and long irregularly triangular grains. It is cultivated to some extent in India.

Wheat being the most esteemed of all the cereals, particularly for the making of bread, the increase of its cultivation and use has marked the progress of agriculture and of wealth in many countries, and particularly in Britain. It is only of late that bread made of wheat has become a common article of food among the laboring classes in Britain. In some parts of the country, it is still, indeed, far from being a principal article of food among the peasantry, who use barley and oats in various forms. In the 8th c., the monks of the abbey of St. Edmund, in England, ate barley-bread, because the income of the abbey would not admit of their using wheaten bread regularly. At a later period, wheat was largely used, at least in the southern parts of England, for a short time after harvest, but the supply was soon exhausted, and recourse was again had to inferior kinds of food. There was then no trade in corn to equalize the price over the year. In 1317, when an abundant harvest had been gathered in, the price of wheat fell at once from 80s. to 6s. 8d. per quarter. The rejoicings of harvest-home were, therefore, in these times connected with a transition from poor to good fare, and from comparative want to abundance, such as happily does not attend the same occasion in our day. Down to the end of the 17th c., wheaten bread was a principal article of food only among the more wealthy; and the servants in their houses were still furnished with oats, barley, and rye. In the northern parts of England, as well as in Scotland, the use of wheaten bread was comparatively rare even at the middle of last century. "So small was the quantity of wheat used in the county of Cumberland," says Eden, in his *History of the Poor* (1797), "that it was only a rich family that used a peck of wheat in the course of the year, and that was used at Christmas. The usual treat for a stranger was a thick oat-cake (called *haver-bannock*) and butter. An old laborer of 85 remarks that when he was a boy he was at Carlisle market with his father, and wishing to indulge himself with a penny loaf made of wheat-flour, he searched for it for some time, but could not procure a piece of wheaten bread at any shop in the town." At the period of the revolution, 1689, the quantity of wheat grown in England was estimated at about 14,000,000 bushels, or about three bushels to each of the population, which was then under five millions. In 1828 about 100,000,000 bushels were produced, or about seven bushels to each of the population, then under fifteen millions (see *Library of Entertaining Knowledge; Vegetable Substances used for the food of Man*, Lond. (1832). In 1890 there were 2,386,336 acres under wheat in England, Wales, Ireland, and in Scotland, the total produce of which may be estimated about 100,000,000 bushels; besides which, a very large quantity of wheat is imported from other countries. The cultivation of wheat now extends to the most northern parts of Scotland, 2,409 acres having been under this crop in 1878 in the county of Elgin, and 3,312 in Ross and Cromarty, and even in Sutherland 52, and in Caithness 10 acres. The population of England and Scotland being now about 30,000,000, it appears that the quantity of home-grown wheat consumed amounts to about 3⅓ bushels for each of the population; but the wheat imported in 1880 amounted to about 76,000,000 bushels, raising the amount consumed to nearly 6 bushels per head of the population. Ireland is left out of account, as not being to a great extent either a wheat-growing or a wheat-consuming country. The produce per acre is greater in Britain than in any other wheat-growing country, owing to superior farming, notwithstanding disadvantages of climate and often of soil. The extent of land now under wheat has, however, of late years diminished, owing to the foreign supply, and the high price of butcher-meat making pasturage now profitable. The quantity of wheat produced in the United States in 1890 was officially given at 399,262,000 bushels. The chief wheat-growing states and their production in 1879 were—Iowa, 32,786,880 bushels; Illinois, 44,896,830 bushels; Minnesota, 3,886,520 bushels; Indiana, 43,709,960 bushels. The progress of wheat-cultivation in the western states has been extremely rapid. The crop of 1885 in the United States fell short of these figures. In 1821 the total exports of wheat from the United States were valued at $178,314, and of wheat-flour at $4,298,043. The total exports of wheat in 1880 were valued at $190,546,305, and of wheat-flour at $35,333,197. This rapid progress is due to the increase of wheat-culture in previously unsettled regions. The greater part of the wheat exported from North America is to Great Britain. Of the wheat imported into the United Kingdom in the year 1890, the United States shipped 3,440,212 quarter, Russia, 3,877,805 quarter, India, 1,822,316 quarter, Australasia, 611,538 quarter, and Canada, 225,749 quarter.

WHEATEAR, or FALLOW-CHAT, *Saxicola œnanthe*, a bird of the genus popularly known by the name chat (q.v.), of the family *sylviadæ*, a common summer visitant of Britain, abounding on downs and fallow fields. Its geographic range is wide. Its winter retreat is in the countries near the Mediterranean, and chiefly in Africa; its summer migrations extend to the furthest n. of Europe, and to Iceland and Greenland. A few wheatears spend the winter on the southern coasts of England. The entire length of the wheatear is about 6½ in.; the tail is almost square; the wings are long and pointed; and the legs are long, enabling the bird to hop about actively in quest of food. Its food consists of worms and insects, and it may often be seen perched on the top of a clod or stone, look-

ing out for them, and at the same time on the watch against enemies. The male is of an ash-brown color on the upper parts; the forehead, a band above the eyes, and the throat, white; a black mark extending from the base of the bill to each eye, and expanding behind it, so as to cover the orifice of the ear; the wings, black; the rump, and two-thirds of the tail, except the two middle feathers, white; the tip of the tail, black; the two middle feathers of the tail, entirely black; the breast, buff-color; the belly and flanks, pale buffy white. The female is less gayly colored, brown and gray prevailing. The wheatear makes its nest in an old wall, or in a crevice of a quarry or gravel-pit, often in a deserted rabbit-burrow, and generally lays six pale-blue eggs. The male has a pleasant, but not loud song, and sings well in confinement, in winter as well as in summer. This little bird is much esteemed for the table, and great numbers are therefore annually caught, not only on the continent of Europe, but in England, where comparatively few small birds are sought after for such use. It is chiefly on the downs of the s. of England, where vast flocks congregate before their autumn migration, that wheatears are caught for the market. The shepherds catch them by means of nooses placed in little excavations made in the ground, advantage being thus taken of the habits of the bird, which upon the least alarm, or even the shadow of a passing cloud, runs to hide itself.

WHEATFIELD, a town in Niagara co., N. Y., including the village of North Tonawanda. Pop. '90, 8808.

WHEAT-FLY, the popular name of certain species of dipterous insects, which are often very injurious to wheat-crops. One of them, *cecidomyia tritici* (see CECIDOMYIA), sometimes called the WHEAT MIDGE, and belonging to the same genus with the destructive Hessian fly of America, is too common both on the continent of Europe and in Britain, but fortunately is not very abundant except in particular years. It is supposed to be the same fly which appeared in the n. of New England in 1828, probably imported from the old world, and thence spread into New York and Canada, destroying a tenth part of the wheat-crop for several years, and only disappearing on being starved out by a change of crop, or by late spring-sowing of wheat. The eggs are deposited in the wheat when it is coming into flower, and the larvæ abstracting the juices, cause the grain to shrivel. The perfect insect appears in June, when great numbers may sometimes be seen on wing in the evening, their chief time of activity. It is about one-tenth of an inch in length, pale ocherous or orange, downy, with large black eyes, and long slender legs; the male with very long antennæ. The antennæ of the male differ much in structure from those of the female, and are of twenty-five joints, while those of the female have only thirteen. The larvæ are small and lemon-colored. A little black ichneumon lays its eggs in the larva of the wheat-fly, and is thus useful to the farmer by destroying it.—The name wheat-fly is also given to species of the genus *chlorops* (see CORN-FLY), destructive to wheat.

WHEATLEY, PHILLIS, 1753–84; a native of Africa; was brought to this country in 1761; purchased by Mrs. Wheatley of Boston, and by her well educated. When yet a girl she wrote many verses, and in 1774, when she was on a visit to England, was published her *Poems on Various Subjects, Religious and Moral, by Phillis Wheatley, Negro Servant to Mr. John Wheatley of Boston, in New England.* The book was reprinted in Boston.

WHEATLEY, WILLIAM, 1816–76; b. and d. New York, a well-known actor. He appeared at the Park Theatre, New York, 1826, playing at first juvenile parts; was for a time one of the managers of the Arch-st. theatre, Philadelphia, and subsequently lessee of Niblo's Garden, New York, where he produced *Black Crook.* Among his best representations were "Claude Melnotte," "Henri de Legardere," and "Captain Absolute."

WHEATON, FRANK, b. R. I., 1833; became a civil engineer, and from 1850 to 1855 was engaged in the boundary surveys of Mexico and California. In 1855 he became a lieut. in the cavalry and took part in the fort Kearney fight with the Cheyennes. In 1861 he was made lieut.col. of volunteers, and was present at the battles of Bull Run, Antietam, Fredericksburg, Gettysburg, Harper's Ferry, the Wilderness, Spottsylvania, and others. He commanded a division at Cedar Creek and elsewhere. At the end of the war he was lieut.-col. in the regular army, and in 1892 rose to the rank of brig.-gen.

WHEATON, HENRY, American jurist and diplomatist, was b. at Providence, R. I., Nov. 27, 1785, educated at Brown university; admitted to the bar in 1802; after which he spent several years in France, and six months in London, engaged in legal and literary studies. On his return to America, he resided in New York, where he contributed papers on international law to the *National Advocate,* a daily newspaper, and was appointed a justice of the marine court. In 1815 he published a *Digest of the Law of Maritime Captures or Prizes,* which has been commended as one of the best works in English on the subject. About the same time he published an *Essay on the Means of maintaining the Commercial and Naval Interests of the United States.* In 1816 he was appointed reporter of the proceedings of the supreme court of the United States, a post he filled until 1827. His reports, filling twelve volumes, a distinguished German has called "the golden book of American law;" and it is considered by the legal profession as a work of extraordinary ability and value. He also made frequent contributions to the *North American* and *American Quarterly Reviews,* and delivered addresses before literary societies. In 1825 he was engaged in revising the statute laws of New York; in

1826 he wrote his *Life of William Pinckney*, of which he furnished an abridgment for Sparks's *American Biographies*. In 1827 he was appointed *chargé d'affaires* to Denmark, and resided at Copenhagen till 1835, when he was appointed resident minister at Berlin, and in 1837, minister plenipotentiary, which post he occupied with distinguished credit until 1846. In 1831 his *History of the Northmen* appeared at Philadelphia, London, and Paris; in 1836, his *Elements of International Law;* in 1841 his *Essay*, for which he received the prize of the French institute, entitled *L'Histoire du Droit des Gens en Europe, depuis la Paix de Westphalie jusqu'au Congrès de Vienne*, which, in 1846, was published, greatly enlarged, in Leipsic and Paris, and an English translation in New York. This work is a standard authority, and its author received the highest honors from the learned societies of Europe, and his own countrymen. Having retired from political life, he died at his residence at Dorchester, Mass., Mar. 11, 1848.

WHEATSTONE, Sir CHARLES, physicist and electrician, was b. at Gloucester in 1802. From school he went to the making of musical instruments, and afterward entered into business on his own account in London. But he was no ordinary manufacturer; the scientific principles involved in the construction of instruments occupied his thought; he made many improvements, and in 1823 published a paper entitled *New Experiments on Sound*. Endowed with remarkable ingenuity, he produced numerous models and apparatus to illustrate the phenomena of acoustics and of light, his attention having been drawn to the latter by the analogies between the two subjects. Few men have done so much toward enabling the student to apprehend the principles on which scientific theories are based, particularly those of the undulatory theory of light.

In 1833 Mr. Wheatstone communicated his first paper, *On Acoustic Figures*, to the Royal society; followed in 1834, by *Experiments to Measure the Velocity of Electricity*, in which, with a mirror revolving 800 times in a second, he demonstrated the velocity at 288,000 m. in a second—greater than that of light. In the same year he was appointed professor of natural philosophy in King's college, London. In 1836 he was elected a fellow of the royal society; and in a course of lectures at the college on the velocity above referred to, he anticipated the electric telegraph by experimenting through 4 m. of copper wire. In May, 1837, a patent was taken out in the joint names of Cooke and Wheatstone, "for improvements in giving signals and sounding alarms in distant places by means of electric currents transmitted through metallic circuits." From this instrument, which had five needles, has grown that system of electric telegraphs which now ramifies over the length and breadth of the United Kingdom. The first working-telegraph—insulated copper wires inclosed in an iron tube—was constructed on the Blackwall railway in 1838.

To enumerate the titles only of Professor Wheatstone's papers on scientific subjects, and describe his various inventions, would fill many pages: a few only can be indicated here. In a paper on binocular vision laid before the royal society in 1838, he explained the principle of the stereoscope, an instrument of his invention: in 1840 he showed that, by means of electro-magnetism, a number of clocks far apart might be kept going with absolute exactitude from one central clock; and in 1843 he brought out his new instruments and processes for determining the constants of a voltaic series. In 1840, and again in 1843, the royal society awarded him their royal medal—a high acknowledgment of the merit of his researches. For a long time after that date, scarcely a year passed without a paper on some recondite scientific subject, or some new invention, or improvement on former inventions, from the hand of Professor Wheatstone, which heightened his reputation, and procured him substantial pecuniary reward. Among his inventions are his cryptograph; his automatic telegraph in two forms; his telegraph thermometer and barometer, by which an observer at the foot of a mountain could read the indications as shown by the instruments on the summit; a machine for the conversion of dynamical into electrical force without the use of permanent magnets, by which large quantities of electricity can be produced at a cheap rate; and an apparatus for conveying instructions to engineers and steersmen on board large steam-vessels.

Professor Wheatstone sat many times on the council, and was a vice-president of the royal society. He was also a corresponding member of the leading foreign scientific academies, and in 1873 he was elected foreign associate of the science department of the institute of France. In 1868 he received from her majesty the honor of knighthood, and in the same year the royal society bestowed on him its Copley medal. He was made LL.D. in 1869 by the university of Edinburgh. He died in 1875.

WHEATSTONE'S BRIDGE. An important electrical instrument for measuring the resistance of wires, etc. The greatest degree of accuracy of measurement is obtained by the so-called Bridge method, in consequence of its employment of an artificial balancing or duplicate resistance with which the other is compared electrically. This second resistance is so constructed as to afford a second path for the testing current, and it is only necessary to determine by means of suitable galvanometers the relative ease with which the current passes through the two resistances to determine the amount of the unknown resistance compared with that of the artificial one, which is, of course, known.

WHEEL AND AXLE, the second of the mechanical powers (q.v.), is a modification of the lever (q.v.). Its most primitive form is a cylindrical axle, on which a wheel concentric with the axle is firmly fastened. When employed for raising heavy weights, the weight is attached to a rope which is wound round the axle, and the power is applied

either to a rope wound round the grooved rim of the wheel, or to a handle fixed at right angles to the wheel's rim (in the latter case, the wheel may be dispensed with, unless it is useful as a conservator of momentum [see FLY-WHEEL], and an ordinary winch substituted). The wheel and axle is neither more nor less than a lever, whose extremities are not points as in the normal form, but the circumferences of circles. Accordingly the power and weight are not attached to particular points in these circumferences, but to cords wound round them, and thus the imaginary simple lever (formed by joining the points where the cords become tangents to the circles), is preserved unaltered in position and magnitude. The conditions of equilibrium are, that P (the power) × the radius of the wheel = W (the weight) × the radius of the axle, or, since the circumferences of circles are proportional to their radii, that P: W:: circumference of axle: circumference of wheel. When there is no wheel, but only a winch, the circumference described by the power in one revolution is substituted for the circumference of the wheel. The *capstan* and *windlass* are simple and common examples of this mechanical power, and combinations of toothed-wheels, or of wheels from one to another of which motion is communicated by an endless band, are compound illustrations of the same. See WINDLASS.

WHEEL-ANIMALCULE. See ROTATORIA.

WHEEL, BREAKING ON THE, a very barbarous mode of inflicting the punishment of death, formerly in use in France and Germany, where the criminal was placed on a carriage-wheel, with his arms and legs extended along the spokes, and the wheel being turned round, the executioner fractured his limbs by successive blows with an iron bar, which were repeated till death ensued. There was considerable variety in the mode in which this punishment was inflicted, at different times and in different places. By way of terminating sooner the sufferings of the victim, the executioner was sometimes permitted to deal two or three severe blows on the chest or stomach, known as *coups de grâce;* and occasionally, in France at least, the sentence contained a provision that the criminal was to be strangled after the first or second blow. Mercy of this kind was, however, not always allowed to be shown to the victims of the wheel; when Patkul, the envoy of Peter the Great, was put to death on the wheel by order of Charles XII. of Sweden, it is said that the officer in command of the guard was cashiered by the Swedish king in consequence of having allowed the head to be struck off before life was extinct in the mangled limbs. The punishment of the wheel was abolished in France at the Revolution; in Germany, it has been occasionally inflicted during the present century, on persons convicted of treason and parricide.

WHEEL-WORK. The arrangement for conveying motion from one axis to another by means of toothed-wheels, is familiar to every one; it has been in use since the days of Archimedes, and was in use, probably, for many centuries before; but it is only in modern times that the action of such wheels has been critically examined and understood. To a superficial observer, the action appears to be extremely simple; a tooth of the driver pushes against a tooth of the driven wheel, thereby causing that wheel to turn round; and, since by this turning the teeth must become disengaged, it is requisite that, before one tooth let go, a second tooth of the driver be ready to take hold of another tooth of the driven wheel. For this purpose, it is enough that the distances between the teeth on the two wheels be alike; in other words, that the diameters be proportioned to the number of the teeth.

When two unequal wheels act upon each other, the smaller one turns faster than the larger. Thus, if a wheel with 60 teeth work into one of 20, the latter will turn 3 times as quickly as the former; and it is on this principle that the trains of clock-work are arranged. For example, the *great-wheel* of a common house-clock may have 180 teeth, and may drive a smaller wheel, or *pinion* as it is called, of 15 leaves, and in this case, if the great-wheel turn once in 12 hours, the pinon must turn once in every hour; the axis of this pinon carries the minute-hand. On the same axis the *hour-wheel* is fixed which may have, say, 96 teeth, and may drive a pinion of 12 leaves. This pinion, then, must turn 8 times per hour, or once in 7½ minutes. On the same axis with this last-mentioned pinion there is fixed the *third wheel,* having, perhaps, 75 teeth, and this drives a pinion of 10 leaves, which, turning 7½ times as fast, must make one turn per minute. On the axis of this last pinion the *escape-wheel* is fixed. This escape-wheel has 30 teeth, each tooth acting twice upon the pendulum, thus making 60 beats per minute. In such a case as this, there is no difficulty in arranging the numbers of the teeth, and these may be varied in many ways, provided the proper proportions be kept. But in other cases, a considerable amount of skill, and often a great deal of labor, is required for the discovery of the proper numbers. Thus, if it be wished to indicate the moon's age on the dial of a clock, we must have an index turning once in the time between new moon and new moon. This time, which astronomers call a *lunation,* averages 29 days, 12 hours, 44 minutes, and nearly 3 seconds (2.853), and it is by no means an easy matter to find out what number of teeth will produce this motion. The mouth-wheel would need to turn rather more than 59 times as slowly as the great-wheel of the clock; and if the mean lunation had been 29½ days, without the odd 44 minutes, the thing could have been managed by making a pinion of 8 teeth lead a wheel of 59 teeth, on the axis of which another pinion, say of 10 teeth is fixed, and made to work a wheel of 50 teeth.

But then such an arrangement would go wrong nearly three-quarters of an hour every month, and in three years would indicate new moon a day too early. In order to obtain a better train, we may compute the number of days in 2, 3, 4, 5 lunations until we get nearly a number of half-days. Now, 16 lunations consist of 472 days, 11 hours, 45 minutes, or almost exactly 945 turns of the great-wheel. This proportion can be obtained by causing a pinion of 12 teeth to lead a wheel of 81 teeth, and another pinion also of 12 teeth to lead a wheel of 105 teeth. This arrangement gives an error of one quarter of an hour in 16 months, or hardly an hour in 5 years. If still greater precision be required, we must carry the multiples further: 33 lunations make 974 days, 12 hours, 13½ minutes, or 1949 turns of the great-wheel of the clock; but then this number 1949 has no divisor, and it is quite impracticable to make a wheel of 1949 teeth; so that we must continue our multiples in search of a better train. In this way, when great exactitude is desired, we often encounter an unexpected amount of labor. For reducing this labor, the method of continued fractions is employed, and the toil is further lessened by the use of tables of divisors.

Such calculations have to be made for the construction of orreries, by which the times of the revolutions of the planets are shown; and engineers have to make them, as when a screw of a particular pitch has to be cut. If, for instance, we have to cut a screw of 200 turns to the French meter on a lathe having a leading screw of 4 turns to the English inch, the axis of the lathe must make 50 turns while the screw makes 39 and a fraction, since the meter is 39.37079 inches. By applying the method of continued fractions, we discover that, for 2,225 turns of the lathe-spindle there must be 1752 turns of the screw; and as these numbers can be reduced into products—viz., 2,225 into 5x5x89, and 1752 into 2x2x2x3x73, we can easily get trains to produce the required effect. From these illustrations, it is apparent that the computation of the trains of wheel work is intimately connected with the doctrine of prime and composite numbers.

The general sizes of the wheels and the number of the teeth having been fixed on, the next business is to consider the shape which those teeth ought to have. Now, for the smooth and proper action of machinery, it is essential that the uniform motion of one of the wheels be accompanied by a motion also equable of the other wheel. Two curves have been known to give this quality of equable motion—viz. the epicycloid, formed by rolling one circle upon another, and the involute of the circle traced by the end of a thread, which is being wound upon a cylinder, or unwound from it. But the general character of all curves which possess this property has been only lately examined. If it were proposed to construct two wheels which shall have their centers at the points A and B (fig. 1), and the one of which may make 5 turns while the other makes 3, we should divide the distance AB into 8 parts, and assign 5 of these for AC, the radius of the one wheel, the remaining 3 parts for the radius BC of the other wheel. Wheels made of these sizes, and rolling upon each other, would turn equably, and if the circumferences be divided into 5 and 3 parts respectively, the points of division would come opposite to each other as the wheels turned. The circumferences of these circles are called the *pitch-lines*, and the portions of them included between two teeth is called the *distance of the teeth;* the distance, or arc CD, on the one wheel must be equal to the distance CE on the other wheel, in order that the motion may bring the two points D and E together. For a reason that will appear in the sequel, we cannot use wheels with so few as 3 or 5 teeth, and therefore we subdivide the distances CD and CE into some number of parts, say 4, and thus obtain wheels of 20 and 12 teeth instead. Since the tooth of the one wheel must necessarily come between 2 teeth on the other, the distance between the teeth must be halved, the one half being given for tooth, and the other half for space.

Having then divided off the pitch-line of the wheel B, as in fig. 1, CD being the distance of the teeth, CG the half distance, let us sketch any contour, CFGHD, for the shape of a tooth, and let us examine what should be the characters of this outline. In the first place, the form of this outline must be repeated for each tooth; and in the second place, the line should be symmetric from the top, F, of the one, to the top, I, of the next tooth, in order that the wheel may be reversible face for face. These obvious conditions having been attended to, let us cut, in thin sheet brass or other convenient material, a disk having this outline, and let us pin its center at the point B. Having prepared a blank disk on which the outline of A is to be traced, let us slip it under the edge of the previous one, and pin its center at the point A. If, now, B and A being held fast, we trace the outline of B upon A, we move each of them slightly but in the proper proportion forward, and make a new trace upon A, and so continue as far as needed, we shall obtain a multitude of curve lines marked upon A. The line which envelops and touches all these curves is, obviously, the proper outline for the wheel A; and thus it appears, that whatever outline, within reasonable limits, may have been assumed for the teeth of B, it is always possible by a geometrical operation, to discover the

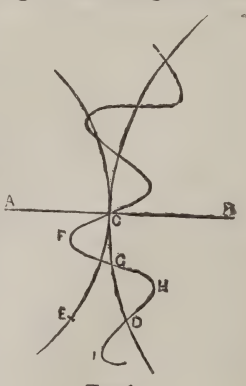


Fig. 1.

proper corresponding form for the teeth of A. These forms may be called *conjugate* to each other, inasmuch as, that if the disk A were now cut out and used as B has been, the identic form of B would be reproduced.

We may obtain a whole series of wheels, A′,A″,A‴, etc., from the same original B; and from A as an original, we may obtain another series, B′,B″,B‴, etc., having various numbers of teeth. And it has been shown that any wheel of the series A will work accurately along with any one of the series B. So far well; but then the wheel A of 20 teeth may not be like the wheel B of the same number of teeth. It becomes, therefore, a desideratum to choose the form of the teeth of B in such a manner that its conjugate of the same number of teeth may have the same form; by such an arrangement, we shall obtain a series of wheels, any one of which will work with any other.

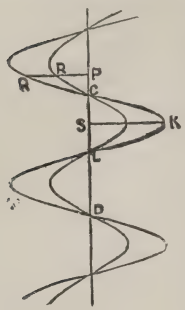


Fig. 2.

If the number of the teeth of B be augmented indefinitely, the outline of the pitch-line will become nearly straight; and so drawing through C (fig. 2) a straight line to touch the pitch-line of A, we shall have the pitch-line of the straight rack, as it is called, which could be worked by any wheel of the series A. The reverse of this rack would work with any one of the series B, and therefore, if the series A and B be identic with each other, the rack must be its own reverse. Thus we obtain a very important general result—viz., that if we mark off along a straight line distances, CD equal to the desired interval between the teeth, and then draw any line CKLMD, consisting of 4 equal parts, CK, KL, LM, MD, symmetrically arranged, all the wheels obtained from this as the original, will work into each other; and moreover the forms thus obtained answer for internal as well as external teeth.

Being then at liberty to choose any line whatever, subject to the above condition of symmetry, for the figure of the straight rack, we may inquire whether it may not be arranged so as to bring about other desiderata. This line, it may be noted, is not necessarily curved; it may be composed of straight lines, or partly of straight and partly of curved lines.

The general appearance of this wavy line recalls that curve known as the curve of sines, which, indeed, is the simplest known curve, consisting of equal and symmetric undulations, and unlimited in extent. By changing the ordinates in any ratio, say in the ratio of PQ to PR, the waves of the curve may be made shallower or deeper; and on studying the effects of such a change, we discover some new and very important laws concerning the contacts of the teeth of wheels.

Beginning with the curve of sines *proper*, in which the greatest ordinate, SK, is equal to the radius of a circle of which CD is the length of the circumference, it is found that wheels traced from it can only touch each other at *one* point: of course such wheels cannot work, because the solitary contact is now on the back and now on the front of the tooth. In this case the contour of the tooth crosses the pitch-line at an angle of 45°. On deepening the teeth, still keeping to the same kind of curve, it is found that the wheels begin to touch at more points than one; and when they are made so deep as that the contour crosses the pitch-line at an angle of 65°, there are always three contacts, neither more nor less. If the teeth be still further deepened, the contacts become more numerous; they appear and disappear in pairs, so that with an inclination of, say, 68°, there would be sometimes three, and sometimes five contacts. When it becomes 70° 17′, there are always five; and with an inclination or 73° 11′, there are always seven points in contact at once.

Of these points of contact, some are on the sides of the teeth, and others are near the top and bottom; the latter, on account of the obliquity of their action, are of no use in driving; they may be called supplementary, and their number is always one less than the number of useful or working contacts. In the system of seven contacts, four are useful, two of them being forward, and two backward, so that two teeth are always in action at once; an arrangement by which a gradual improvement in the equality of the teeth is secured by their wearing.

When two properly formed wheels are put in motion, the points of contact move also, and describe a peculiarly shaped line, the nature of which depends on the character of the primary form adopted for the tooth of the straight rack. Conversely, if this path of the points of contact be first assumed, and the law of motion in it be observed, the form of the tooth of any wheel may thence be obtained; and this leads us to the most convenient way of making the delineation.

In fig. 3, the form of the straight rack and the corresponding shape of the teeth of a wheel of 20 are shown in contact, the depth of the tooth being such as to give five contacts, which in the drawing are at the five points marked 0. If we suppose the rack to be slid upward, carrying the wheel along with it, the points of contact will change; and when the motion has been one-eighth part of the interval between two teeth, these points will occupy the positions marked 1. When a motion of another eighth is made, the two upper contacts on the left hand merge into one, and are about to disappear; at the same instant, two new contacts begin at the lower point, marked 2; and thus the motion

continues in the order of the numbers marked along the peculiarly shaped path of the points of contact. Those contacts which occur along the crossing lines of the curve are working contacts; those which happen along the two external arcs, are supplementary. When the form of this path, and the positions of the successive points in it have been obtained by calculation, the outline of any wheel is easily traced geometrically.

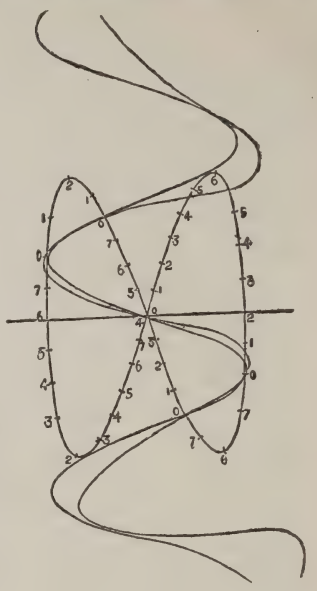


Fig. 3.

In well-constructed machinery there should never be fewer than seven contacts in the system, since of these only four are working; and therefore only two teeth are fully engaged; and it is necessary that two teeth be engaged at once, in order that the wearing may tend to remove any unavoidable inequalities of workmanship.

When we attempt to delineate the forms of wheels with few teeth by help of any of these orbits, we find that the contours overlap each other; in such cases the following tooth of the conjugate wheel effaces, as it were, the trace belonging to the preceding tooth; and the contacts, though still holding good of the geometrical curves, become mechanically impossible. Thus it is that there are limits below which we cannot go in the numbers of the teeth. If the overlapping occur at the shoulder of the tooth some of the useful contacts are wanting; but when the replication is only at the point of the tooth, the want of the supplementary contact occasions no inconvenience. An examination of the different cases shows that, with seven contacts, the smallest numbers which can be used on the three systems just mentioned are 19, 17, and 11, so that the system of epicycloidal teeth has, in this respect, the advantage over the others. Clock pinions, then, should not have fewer than eleven leaves. This method of considering the subject was first published by the writer of this article in *A New General Theory of the Teeth of Wheels* (Edinburgh, 1852).

It remains to cut the actual wheels to the shapes thus formed. The essentials of the operation are these: The blank wheel is attached to the axis of a large divided circle, which can be turned round and held in any desired position. A cutter, generally a revolving cutter, is brought down upon the blank, so as to notch out the space between two teeth; this done, the circle is turned round by the proper number of divisions, and another space is cut, and in this way the whole circumference of the wheel is gone over. In order that the work be well done, it is essential that the cutter be truly shaped; and when the edges get blunted by use, it is no easy matter to avoid spoiling the shape in the resharpening. Whatever system be followed, the form of the tooth varies from one number to another, so that the cutter which answers for a wheel of 20 cannot do for one of 30 teeth; and hence, when accurate results are wanted, there must be a cutter for each wheel. In order to avoid the expense of so many cutters, each requiring to be carefully made, the slovenly practice is too often followed of having, perhaps, two cutters, one to be used for pinions, the other for wheels; and the result is the intolerable noise which is so common in mills, and which, if properly understood, should be taken as an indication of unnecessary expenditure of power.

When, as in the wholesale manufacture of clocks and watches, multitudes of wheels are to be cut of one size, careful attention can be given to the shape of the cutter. The labor is economized by binding a considerable number of blanks together on the dividing engine, and plowing out the teeth of the whole of them at once. For the small wheels, technically called pinions, which cannot conveniently be fixed on the dividing-engine, *pinion-wires* are used; these are wires of brass or steel drawn through holes of the proper shape, and having the leaves running all along them. The watchmaker removes the leaves from those parts where they are not wanted, and thus obtains the pinion and its axle in one piece; in this way he gains the advantages of solidity and economy of workmanship.

Among the many purposes to which wheel-work is applied, it sometimes happens that an unequable motion is wanted. Thus, in the construction of an orrery, it is desirable that while one index turns uniformly to show the time, another may turn so as to show the unequal motion of the sun in the ecliptic. In that case the variations of the velocity are small, and it is enough to divide the teeth unequally, as the slight inequality can hardly affect the working of the apparatus. But when the changes of velocity are considerable, the matter must be more carefully looked into. If we suppose the pitch-lines of two wheels to be uneven, and to roll upon each other without regard to the positions of their centers, the forms of teeth to be arranged upon those pitch-lines may be traced out almost in the manner already explained for round wheels. The pitch-line must be divided into equal distances, and the disk must receive a half-sliding, half-

turning motion, so that the pitch-line may pass through the point C (fig. 4) always perpendicularly to the line AB, which is the line of centers for round wheels. The combination of this motion with the proper motion of the points of contact gives true forms for the teeth.

Thus, the form of the tooth can be obtained when that of the pitch-line is known. Now, when two disks, turning on fixed centers, touch each other at any point out of the straight line joining these centers, there is a slipping of the one surface over the other; and therefore, in order that the pitch-lines may roll together, they must be so shaped as that the point of contact may be in the line of centers. It can be shown that, for any assumed contour of the wheel A, another contour having its center at B, and rolling upon A, is possible. But, except in one or two special cases, the working out of the problem has not been accomplished. It will be enough here to mention the single case of elliptic wheels. The action of these is founded on the well-known property of the ellipse, that the sum of the distances of any point in it from the two foci is constant, and that the curve makes equal angles with these two lines. Hence two equal ellipses turning on their foci, when their centers are at a distance equal to the major axis of the ellipse, will roll upon each other; and teeth formed upon these as pitch-lines will work perfectly. When the ellipses have their major and minor axes in the proportion of 5 to 4, the focus is at one-fifth part of the major axis from one end; and therefore one focus, at one part of the revolution, moves four times as fast—at another part, four times as slowly—as the other focus.

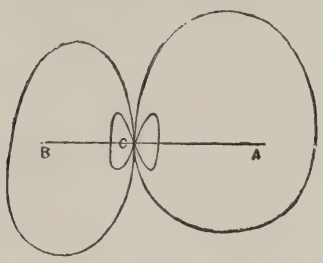


FIG. 4.

Sometimes one of the wheels has to be quite at rest during part of the motion of the other wheel. This is accomplished by causing some part of the wheel that is to be stationary, to bear upon a part of the circumference of the moving-wheel which is concentric with its axis. This is exemplified in the arrangement for counting wheels shown in fig. 5. The object of this apparatus is to count and record the revolutions of the wheel B. As this wheel turns round, a pin E attached to it enters into the slit GH, and thus carries the wheel A round as long as the pin remains in the slit, that is, until the slit GH be brought into the position IK. As soon as E leaves the slit at I, there would be no further connection between the two wheels, and A could be moved anyhow, altogether independently of B. In order to prevent this, the disk B is made nearly five-sixths entire, and parts of A are scooped out between the slits so as to receive and to fit B. By this means A is prevented from being turned either backward or forward until the pin E again comes into one of the slits. When this happens, the projecting part at G finds room in the recess F. If there be seven slits, GH, round the wheel A, and if B turn once in twenty-four hours, an index attached to A would show the days of the week; and the index might be made to be stationary all day, the change being effected during the night. Another example of this kind of interrupted motion is seen in the ordinary dead-beat clock escapement, in which the detaining surface of the pallet is concentric with the axis of the crutch.

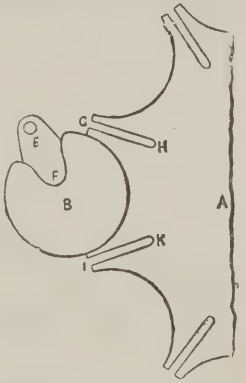


FIG. 5.

When the axes are inclined to each other, *beveled* wheels are used. Just as common wheels may be regarded as fluted cylinders, beveled wheels may be described as fluted cones having a common apex. The principles which regulate the formation of the teeth of these are the same as for plane wheels, but the application of these principles is considerably more intricate. Since both the teeth and the spaces between them are tapered, it is impossible to notch out the intervals by a single cut of a revolving cutter. Milling machines are now used for planing the teeth by means of a cutter moving in a line toward the apex of the cone. The subject is treated in great detail in *Kinematics, or Mechanical Movements*, by C. W. MacCord.

WHEELER, a co. in n. Nebraska; formed 1877; traversed by Cedar creek; surface rolling; soil fertile; 576 sq. m. Pop. '90, 1683. Co. seat, Bartlett.

WHEELER, a co. in n. Texas; formed 1876; organized, 1879; 900 sq. m. Pop. '90, 778. Co. seat, Mobeetie.

WHEELER, BENJAMIN IDE, was born at Randolph, Mass., July 15, 1854. He studied at the Colby academy, New London, and graduated at Brown university in 1875. From 1875 to 1879 he taught in the Providence high school, and was tutor in classics at Brown university, 1879–81. For the next four years he pursued courses at Leipzig, Heidelberg, Jena, and Berlin, receiving his degree of Ph.D. from Heidelberg in 1885. Returning to the United States, he became instructor at Harvard university in 1885, and professor of

comparative philology at Cornell university in 1886. He is the author of *The Greek Noun-accent* (Strassburg, 1885); *Analogy, and the Scope of its Application in Language* (Ithaca, 1887); *Principles of Language Growth* (London, 1891); joint editor with H. A. Strong and W. S. Lageman; and has contributed to the *Classical Review*, *American Journal of Philology*, etc. In 1895–96 he was director of the American school at Athens.

WHEELER, David Hilton, D.D., b. Ithaca, N. Y., 1829; moved west; was educated at the Rock River sem., and was ordained in the ministry of the Meth. Epis. church. He was a tutor in his alma mater, and was prof. of Greek at the Iowa Conference sem., Mt. Vernon. He was appointed by Pres. Lincoln U. S. consul to Geneva, and became the correspondent from that city of the New York *Tribune* and the Chicago *Tribune*. Upon his return to the U. S. he was appointed prof. of English literature and history in the Northwestern univ. While in Chicago he edited the *Lakeside Monthly;* was editor of the *Methodist*, 1875. He has pub. *Brigandage in South Italy*, and has translated Celesias' *Conspiracy of Giov. Luigi Fieschi.*

WHEELER, Joseph, M. C., born in 1836, was graduated from West Point in 1859, and received a commission in the U. S. army, which he resigned in 1861 to join the Confederate army. He served with distinction in nearly all of the military operations of the southwest. After the war he was lawyer and cotton planter until 1880, when he was elected to congress from Alabama. His election was contested and he was deprived of his seat, but was re-elected in 1884, 1886, 1888, and 1890.

WHEELER, Nathaniel, b. Watertown, Conn., 1820; received an ordinary education, and engaged in manufacturing. In 1850 Allen B. Wilson brought to his notice certain inventions and improvements in the manufacture of sewing-machines. Mr. Wheeler and others furnished the necessary capital, and in 1852 a patent was obtained, and the "Wheeler and Wilson Manufacturing company" was founded. The immense works of this establishment are now at Bridgeport, Conn. See Sewing-Machines.

WHEELER, William Almon, born Malone, N. Y., 1819; entered the university of Vermont, but did not graduate. He then studied law, was admitted to the bar, and was for some time district attorney of Franklin co., N. Y., which he represented in the assembly in 1850–51. He served in the New York senate in 1858–58, was president of the New York constitutional convention, 1867–68, a member of the 37th, 41st, 42d, 43d, and 44th congresses; and during the 43d chairman of the special committee which went to Louisiana and brought about the "Wheeler compromise." He was vice-president of the United States, 1877–81. He showed high legal attainments and a balanced judgment. He d. at Malone, June 4, 1887.

WHEELER, William Adolphus, 1833–74; b. Mass.; graduated at Bowdoin college, 1853, and for some years taught school. In 1859 he became the assistant of Worcester in the compilation of his dictionary, and afterward did important work in the revision of Webster's dictionary and in editing Hole's *Biographical Dictionary* and the *Dickens Dictionary*. From 1867 until the time of his death he was assistant librarian of the Boston public library.

WHEELING, city, port of entry, and co. seat of Ohio co., W. Va.; on the Ohio river, and the Baltimore and Ohio, the Cleveland, Lorain, and Wheeling, the Pittsburg, Cincinnati, Chicago, and St. Louis, the Wheeling and Lake Erie, the Ohio River, and other railroads; 65 m. s.w. of Pittsburg. It was settled by Ebenezer Zane in 1769, was laid out as a town in 1793, incorporated as a town in 1806, and as a city in 1836, and was the state capital in 1863–70 and 1875–85. It contains a U. S. government building, Wheeling and city hospitals, public library under the direction of the board of education, Masonic and Odd Fellows halls, national, state, and savings banks, over 30 churches, including the Roman Catholic cathedral of St. Joseph, electric light and street railroad plants, and waterworks on the Holly system. The U. S. census of 1890 reported for Wheeling, 418 manufacturing establishments, employing $8,494,630 capital and 6850 persons, paying $3,037,727 for wages and $7,381,940 for materials, and having a combined output valued at $13,022,589. The principal manufactures are iron and steel nails and spikes, iron and steel, malt liquors, glass, cigars, tanned leather, planing-mill products, and foundry and machine-shop products. There are suspension and steel bridges, the former over 1000 feet long and connecting the mainland with Zane's island, which constitutes one of the city wards, and Wheeling and Mozart parks. The city has a large river trade, and exports a great quantity of bituminous coal, in which the vicinity is rich, annually. Pop. '90, 34,522.

WHEELOCK, Eleazar, D.D., 1711–79; b. Conn.; graduated Yale college, 1733; ordained pastor of the Congregational church, Lebanon, Conn., 1735; established a school at Lebanon for the education of Indian youth, from which afterward grew Dartmouth college. He removed to Hanover, N. H., 1770, and was the president of the new college for 9 years. He published a *Narrative of the Indian School.*

WHEELOCK, John, D.D., LL.D., 1754–1817; b. Conn.; studied 3 years at Yale college; went with his father to Hanover, 1770, and graduated at Dartmouth college, 1771; was tutor, 1772–74; represented Hanover in the legislature, 1775; served for a time in the continental army; became lieut.col. and maj.; was on Gates's staff; elected president of the college on the death of his father, 1779; visited England, 1783, to obtain funds; was removed, 1815, on account of an ecclesiastical controversy, but restored in 2 years. He published *Sketches of Dartmouth College.*

WHEELWRIGHT, John, 1592–1679; b. England; graduated Cambridge, 1614; vicar of Bilsby, 1623–31; suspended by Laud for nonconformity; came to America, 1636; pastor at Braintree, Mass. His adoption of the religious views of his relative, Ann Hutchinson, alienated Mr. Wilson pastor of the Boston church; this and a sermon considered seditious caused his banishment from the colony by the general court, 1637. He went to New Hampshire, founded the town of Exeter; organized a church; removed with a part of the church to Wells, Me.; returned to Massachusetts, 1646; was minister at Hampton, 1646–54; went to England and was well received by Oliver Cromwell, who had been his classmate; returned, 1660; pastor of Salisbury, N. H., 1662. He published a reply to Thomas Welde's *Mercurius Americanus* (1645), and a *Vindication* (1654).

WHEELWRIGHT, William; 1798–1873; b. Mass.; became a sailor, and engaged in trading on the coast of South America. In 1835 he undertook to establish a line of steamers on the w. coast, and the result was the great Pacific Mail steamship company. From 1842 until the time of his death he was engaged in the construction of South American railroads, the most important being that from Caldera across the Andes to Rosario on the Parana, 934 m., opened in 1872. Wheelwright was the first to introduce the telegraph system and lighting by gas into South America.

WHELK, *Buccinum* a genus of gasteropodous mollusks, of the family *buccinidæ*. The shell is ovate, turreted, and more or less ventricose; its mouth ovate, emarginate, or produced into a very short canal below, the outer lip expanded, the inner lip usually thin and smooth within. The operculum is horny. The animal has a broad head, with two tentacula, with the base of which the stalks bearing the eyes are united, the proboscis is large, and the tongue armed with teeth, which are used for the purpose of rasping substances used for food—almost any animal substance being welcome for this use—or for perforating the shells of other mollusks in order to prey upon them. There are about 20 known species, chiefly found on the coasts of the colder parts of the world. The British coasts produce several species, of which the most abundant is the Common Whelk (*B. undatum*). It occurs from low-water mark to a depth of 100 fathoms, is some times 3 in. in length, grayish or brownish white, with numerous raised ridges and spiral striæ. It is very widely distributed in the northern parts of the northern hemisphere, and is one of the most common mollusks of the arctic regions. It is much used as an article of food, is cooked simply by boiling, and is generally eaten with vinegar and pepper.

WHEWELL, William, D.D., was b. in 1794 at Lancaster. His father intended him for his own trade—that of a joiner; but the boy having excelled at school in mathematics was persuaded to go to Cambridge. He entered at Trinity college, and graduated (second wrangler, and second Smith's prize-man) B.A. in 1816. He became a fellow, and afterward a tutor of Trinity, where also, for many years, he acted as a successful "coach," or private tutor. In 1820 he became a fellow of the royal society. Between 1828 and 1832 he was professor of mineralogy in Cambridge; and between 1838 and 1855, professor of moral theology, or casuistry. In 1841 he was appointed master of Trinity; and in the same year, he was president of the British association at its meeting at Plymouth. He was also, for a time, president of the geological society. In 1855 he became vice-chancellor of the university of Cambridge. He died at Trinity (1866), in consequence of injuries sustained through a fall when riding.

Whewell, when he acted as a private tutor, produced several text-books on mathematical subjects (one of which, his *Dynamics* [1823], is deservedly admired), which were for a time popular, but may now be said to have been superseded. He also contributed a variety of papers to the transactions of learned and scientific societies, and to scientific journals, and to the reviews. In some of these, he treated of such subjects as the tides, electricity, magnetism, and heat; in others, of abstruse and recondite subjects, literary, historical, and metaphysical. Later in life, while he continued to write papers of this class, he concentrated his powers mainly on the production of large works. Among the most important of his books are—*Astronomy and General Physics considered in Reference to Natural Theology*, being the third Bridgewater treatise (Lond., 1833); *History of the Inductive Sciences, from the Earliest to the Present Times* (3 vols., Lond., 1837); *The Philosophy of the Inductive Sciences, founded upon their History* (2 vols., Lond., 1840); *The Elements of Morality, including Polity* (Lond., 1855). Among his other works are—*The Plurality of Worlds*, which had considerable popularity from its subject; *The History of Scientific Ideas, Novum Organum Renovatum; Notes on the Architecture of German Churches; Lectures on the History of Moral Philosophy in England; Indications of the Creator;* translation of Goethe's *Herman and Dorothea;* translation of Auerbach's *Professor's Wife;* translation of Grotius's *Rights of Peace and War;* a translation of Plato's works; and *The Platonic Dialogues for English Readers.* Besides these books, he published many essays, as yet uncollected. His last composition, so far as is known, is an attack on Comte and Positivism, which appeared in *Macmillan's Magazine* after his death.

Whewell's acquisitions were most various; it would have been sufficient occupation for the lives of most book-worms to have made them. His writings, again, were so various and voluminous, it might be thought sufficient employment of the life of a mere clever book-maker to have produced them. Whewell was neither book-worm nor book-maker. A clear-headed student, he was always increasing his stock of knowledge; a vigorous and independent thinker and writer, he was always giving forth the results of his studies to the public; and having thus proceeded during a long life of almost unin-

terrupted good health, he may be taken as illustrating what at the best may be achieved by a man of ambition, ability, and unflagging industry, without genius. He was nowise superficial, like many pretenders to encyclopædic knowledge; he was really master of all that could be learned on a great many subjects. It has been said of him, "knowledge was his forte, omniscience his foible;" but it is absurd to suggest that a man can have and strain after too much knowledge, if it be, as his was, thorough knowledge. His chief ambition was to grasp, survey, and co-ordinate the sciences; and he did excellent service both to science and history in the effort to gratify it. The task suited one of his extraordinary acquisitions, good sense, and philosophic comprehension. Had he been a man of more imagination and ingenuity, he might, of course, have been better employed in endeavoring to advance some single science. As he was, this was beyond him: he made some original investigations; but the results must be pronounced unimportant.

Whewell was a large, strong, erect man, with a red face and a loud voice. He was an effective preacher and lecturer, though in both characters wanting in that "something" which wins and rivets the hearer. He was accused of being arrogant; and his general bearing gave color to the charge. A story, long current, may be told as illustrating at once his varied knowledge and his personal relations to his brother fellows. He used so to overwhelm with his learning the company at the fellows' table and in the combination room, that a conspiracy was formed to put him down. Some fellows got up a knowledge of Chinese music from scattered articles in old reviews, with which they presumed he would be unacquainted. They then made Chinese music the subject of, as it were, a casual conversation at table. For a time, contrary to his usual habit, he took no part in the conversation. When they had about exhausted themselves, however, he remarked: "I was imperfectly, and to some extent incorrectly, informed regarding Chinese music when I wrote the articles from which you have drawn your information." They were caught in their own trap, and had, as on other occasions, to submit to be instructed. See Todhunter's *W.*, and *Life* by Mrs. Douglas.

WHEY. When any substance, possessing the property of coagulating casein, is added to milk, the coagulated casein separates in flakes and clots, and sinks to the bottom, constituting what is termed the *curds;* while the supernatant, straw-colored fluid is known as the *whey*. Cheese-making affords the principal source of whey, which, thus obtained, forms, like butter-milk, a very valuable kind of drink. The whey of goat's milk is regarded as specially beneficial, and in Switzerland and elsewhere, large establishments have been set up for carrying out the *whey-cure*, either alone or in association with the grape-cure. There can be no doubt that, were the cases judiciously selected, much good, in the way of eliminating morbid matter, might be effected in a few weeks by confining the patients to a diet of brown bread, grapes, and whey; while, on the other hand, many diseases might be much aggravated by that treatment. In ordinary medicine, we recognize several useful varieties of whey, as: White-wine whey, prepared by the addition of sufficient sherry to a tumbler of heated milk to coagulate the casein. On decanting off the whey from the curds, and sweetening, we obtain a favorite sudorific draught, which may be taken with advantage as a sudorific at bedtime, whenever there is a threatening of incipient cold in the head. *Cream of tartar whey* and *niter whey*—the former prepared by boiling 100 grains of cream of tartar in a pint of milk, and the latter by the similar use of niter—act in the same way as wine whey, but more powerfully. *Tamarind whey* has been already described in the article on that fruit.

WHIG, the name given to the adherents of the colonial cause during the controversy between Great Britain and her American colonies, and during the revolutionary war. The adherents of the crown were called tories or loyalists. The term whig lost its political signification in this country till 1832, when it was revived, and assumed by the opponents of Jackson, who then dropped the name of national republicans, by which they had been known and took that of whigs, imitating the English whigs, whose opposition to the power of the throne they compared to their own opposition to Jackson's extensive use of the veto-power. For its history, see UNITED STATES.

WHIG AND TORY, the names which for the last two centuries have been popularly applied to two opposite political parties in Great Britain. Both were at first names of reproach. *Whig* was originally a nickname of the peasantry of the western lowlands of Scotland, said by some to be derived from a word or sound used by them in driving their horses; by others, from *whig*, "an acetous liquor subsiding from sour cream."—*Jamieson*. Its next application was to the bands of Covenanters, chiefly from the west of Scotland, who, subsequently to the murder of archbishop Sharpe, took up arms against the government, and after gaining some successes in encounters with the king's troops, were defeated at Bothwell bridge. Thence the name whig (or whigamore) came to be fastened, first on the whole Presbyterian zealots of Scotland, and afterward on those English politicians who showed a disposition to oppose the court, and treat Protestant nonconformists with leniency. The word *tory*—said to be derived from *tora, tora*, in Irish, "give, give," or "stand and deliver"—was first given to certain bands of outlaws, half-robber, half-insurgent, professing the Roman Catholic faitn, who harassed the English in Ireland; and was thence applied reproachfully to all who were supposed to be abettors of the imaginary popish plot; and then generally to persons who refused

to concur in the exclusion of a Roman Catholic prince from the throne. These two nicknames, which came into use about 1680, immediately became familiar words, and have since been retained as designations of two opposite political sides—the tories being, generally speaking, the adherents of the ancient constitution of England without change, and the supporters of regal, ecclesiastical, and aristocratic authority; while the whigs have been the advocates of such changes in the constitution as tend in the direction of democracy. The most sweeping constitutional change of the present century which the whigs have carried is the reform bill of 1832. Each party, while preserving within certain limits a general consistency of purpose, has undergone many changes in its principles, professions, and modes of action with the altering circumstances of the country; and among persons who have been considered adherents of each side at any given time, there have seldom been wanting a variety of more or less distinctive shades of opinion. A division in the ranks of either party has often led the more moderate section of that party to coalesce with the opposite side; and at other times, the extreme party of innovation, dropping their connection with the whigs, have adopted another name, as when those politicians whose desire was to have the whole institutions of the country remodeled on a democratic basis, assumed the designation of *radical reformers* or *radicals*. See also CHARTISM. For a considerable time after the reform bill, the governing section of the whig party were more disposed to maintain the principles of the changes already made, than to insist on further constitutional changes; and the principles maintained by whigs and tories sometimes approximated so closely that the difference seemed more one of men than of measures. Sometimes one party, sometimes the other, has appeared as the advocate of measures which have proved beneficial. In the agitation for the repeal of the corn-laws, which lasted from 1841 to 1846, the tories were ranked on the side of protection, and the whigs of free trade; but the relations of the two parties had been the reverse at a former period, when Mr. Pitt's advocacy of free trade between England and Ireland was opposed by the manufacturers of Lancashire, who succeeded in getting his measure postponed. During the last thirty years, the names *liberal* and *conservative* have to a great extent superseded the former party designations of whig and tory. See LIBERALS; LIBERAL UNIONISTS.

WHIMBREL, *Numenius phœopus*, a bird of the same genus with the curlew (q.v.), and much resembling it in form, plumage, and habits, but of smaller size, and with a bill considerably shorter in proportion. The female, which is larger than the male, is about eighteen inches in length, the bill being about three inches and a half. The plumage of the whimbrel is of a bright ash color, with streaks of brown on the neck and breast. The whimbrel is a very widely distributed bird, being found from the north of Africa and of India to the arctic regions of Europe and Asia. It occurs also in Japan. It is a bird of passage, and visits Britain chiefly in the course of its spring and autumn migrations. A few whimbrels breed in Shetland; but the number is diminishing, the eggs being in great request as a delicacy. The flesh is also highly esteemed.

WHIN. See FURZE.

WHIN-CHAT, *Saxicola rubetra* (see CHAT), a bird very similar to the stone-chat (q.v.), a summer visitant of Britain and of the northern parts of Europe. It is widely diffused over the British islands in summer, but nowhere very abundant. The head, sides of the neck, and upper parts of the body are blackish brown, each feather bordered with rusty yellow; an elongated streak of white above each eye; the throat and a streak on each side of the neck white; the breast, rust-color; a large white spot on each wing; the tail white, except the two middle quills and the tip, which are blackish brown. The colors of the female are less distinct than those of the male. The whin-chat frequents furze (or whin) bushes. Its song is pleasant.

WHIP (Parliamentary slang). A name applied to that member of the English Parliament whose duty it is to compel the attendance of his party, especially when a party vote is taken at divisions. The minor patronage of the Treasury is put into the hands of the ministerial whip in order to increase his influence.

WHIPPING. Corporal punishment by whipping, public as well as private, was formerly often awarded by the criminal law of England for minor offenses, such as petty larceny, and was not unfrequently superadded to some other punishment, such as imprisonment or the pillory. In early times, and by the usage of the star-chamber, whipping could not be competently inflicted on a gentleman.—In Scotland sentence of whipping was also frequent, the terms of the sentence sometimes requiring it to be repeated at intervals and in different parts of the kingdom. In the last century the Scottish burgh magistrates were in the habit of awarding sentence of whipping on summary convictions for police offenses, such as broils, street outrages, and the keeping of disorderly houses; but in modern practice the competency of inflicting this sentence at common law without the intervention of a jury has been made matter of doubt. Whipping used not long since to be an occasional addition to the sentence of the justiciary court on persons convicted of aggravated assaults.

The infliction of corporal punishment by whipping on women was prohibited by act 1 Geo. IV. c. 57. In act 5 and 6 Vict. c. 51, directed against attempts to injure or

alarm the queen by discharging fire-arms in her majesty's neighborhood, or otherwise, the infliction of public or private whipping not exceeding three times is made part of the punishment. Act 26 and 27 Vict. c. 44 (not applicable to Scotland) authorizes whipping in addition to penal servitude in convictions for robbery, assaults with intent to rob, and attempts to strangle or render insensible with a view of committing a crime, the number of strokes not exceeding 50 in the case of an adult, or 25 in the case of a boy under 16. Recent legislation, both in England and Scotland, has made various provisions for the infliction of this description of corporal punishment on juvenile culprits. Whipping of boys under 16 for various offenses is authorized by the English criminal consolidation act (1861); it being provided that the whipping is to be private, and not repeated more than once, and the instrument of punishment to be specified in the sentence. Similar provisions, with some additional ones, occur in 25 Vict. c. 18, as to the mode in which the same punishment is to be administered on summary convictions by justices. In Scotland, the prisons amendment act, 14 and 15 Vict. c. 27, and the act 23 and 24 Vict. c. 105, which superceded it, authorize the whipping of boys under regulations made by the lord advocate and approved by the secretary of state. By act 25 Vict. c. 18, no person above the age of 16 can now be whipped in Scotland for theft, or any crime against person or property. It is a very general impression among magistrates that whipping to the moderate extent allowed by 26 and 27 Vict. has had a most salutary effect in repressing certain kinds of outrage, the apprehension of mere imprisonment, or even of penal servitude, having little efficacy in the way of prevention. Thus, personal chastisement, the oldest form of punishment for crime, has to a certain extent been resumed in the administration of the criminal law.

As regards corporal punishment in the army and navy, see FLOGGING.

WHIPPLE, ABRAHAM, 1733–1819; b. Providence, R. I.; capt. of a privateer during the French and Indian wars. In 1772 he was commander of the expedition from Providence which burned the British schooner *Gaspee* in Narragansett bay, and 3 years later, with 2 armed vessels and 2 row galleys, he captured one of the tenders to the British frigate *Rose*. He commanded the schooner *Providence*, which did great damage to British shipping; and on her capture took command of the frigate *Providence*. In 1779 he fell in with a fleet of nearly 150 sail, under the protection of a 74-gun ship and some smaller vessels. Putting his guns out of sight, he ran up the British flag, joined the merchantmen, captured one every night, and sent her home with a crew taken from his own. He thus captured 10 vessels, 8 of which reached America in safety. In 1780 he lost his vessels, and was captured, while trying to rescue Charleston with a squadron; and he remained a prisoner till the close of the war.

WHIPPLE, AMIEL W., 1818–63; b. Mass.; graduated at West Point in 1841, and was appointed to the engineers. He was assistant astronomer to the commission on the n.e. boundary between the United States and Canada, 1844–49, and to the commission to determine the Mexican boundary, 1849–53. He was afterward engaged in surveys for a Pacific railroad, as a light-house engineer, and in other topographical work. In the war of the secession he was chief-engineer on McDowell's staff till 1862, when he was made brig.gen. and put in command of a brigade to protect Washington. He was in command of a division of the 3d corps of the army of the Potomac at Fredericksburg and Chancellorsville, and was mortally wounded at the latter battle.

WHIPPLE, EDWIN PERCY, b. Mass., 1819; clerk in banking houses at Salem and Boston, and afterward, till 1860, superintendent of the reading-room in the merchants' exchange in the latter city. He delivered poems and orations before various societies, and was a frequent contributor to the *North American Review*, to the *Atlantic Monthly*, the *Christian Examiner*, and other periodicals. Among his works are, *Literature and Life; Essays and Reviews; Character and Characteristic Men;* and *Success and its Conditions*. He d. 1886.

WHIPPLE, HENRY BENJAMIN, D.D., b. N. Y., 1822; was a merchant; studied theology with the Rev. Dr. Wilson; ordained deacon in the Protestant Episcopal church at Geneva by bishop Delancey; ordained priest at Sackett's Harbor, 1850; minister of Zion church, Rome, N. Y., 1850; rector of the church of the Holy Communion, Chicago, 1857; elected and consecrated bishop of Minnesota, 1859. He has been a warm friend and defender of the Indians, among whom he has established missions, which have been probably the most successful of such efforts. He advocates free churches, and nearly all churches in his diocese are free. He is held in very high regard as a sagacious, efficient, and devoted Christian laborer.

WHIPPLE, WILLIAM, 1730–85; b. Me.; became a sailor and engaged in the West India trade, in which he gained a fortune. He was a member of the provincial congress and committee of safety of 1775, and of the continental congress of 1776, being one of the signers of the declaration of independence. He led the New Hampshire troops at the battle of Saratoga; in 1778 was again in congress; and at the close of the war became a judge of the state superior court.

WHIP-POOR-WILL, *Caprimulgus* or *Antrostomus vociferus*, a species of goatsucker (q.v.), a native of North America, common in the eastern parts of the United States. It receives is popular name from the fancied resemblance of its notes to the words *Whip*

poor Will. It is about ten inches long, the plumage very like that of the European goat-sucker, much mottled and indistinctly marked with small transverse bands, the top of the head streaked with black, a narrow white collar on the throat. The bristles at the base of the bill are very stiff, and more than an inch long. This bird is seldom seen during the day, but seeks its food by night, catching moths, beetles, and other insects on the wing. Its flight is near the ground, zigzag, and noiseless. Its notes are heard only during the night, and are clear and loud, so that when a few of these birds are close at hand, the noise is such that those unaccustomed to it cannot sleep. In the more southern parts of the United States, the whip-poor-will is replaced by a larger species, the chuck-will's-widow (q.v.), and on the upper Missouri and to the west by a smaller one (*C.* or *A. Nuttalli*). See illus., BIRDS, vol. II.

WHIRLPOOL, a circular current in a river or sea, produced by opposing tides, winds, or currents. It is a phenomenon of rare occurrence on a large scale, but illustrations in miniature may be noticed in the eddies formed in a river by means of obstacles or deflections. The two celebrated sea-whirlpools, Charybdis (see SCYLLA) and Malström (q.v.), are now known to be merely "chopping seas," caused by the wind acting obliquely on a rapid current setting steadily in one direction while the tide is flowing, and in the opposite direction when it is ebbing. During calm weather, neither of these so-called whirlpools is dangerous for large ships, but when the current and the wind are strongly in opposition, the broken swell is so violent and extensive in the Malström as to founder large ships, or drive them against the rocks. Though in neither of these two cases, formerly so much dreaded, is there any vortical action, instances of such action do actually occur in various localities, as in the whirlpool of Corrievrekin (q.v.), and in some eddies produced by opposing winds and currents among the Orkney Islands.

WHIRLWINDS AND WATERSPOUTS. Whirlwinds differ in many respects from the storms described in the articles STORMS and TYPHOONS. They seldom continue longer than a minute at any place, and sometimes only a few seconds; their breadth varies from a few yards to nearly a quarter of a mile during their short continuance, the changes of the wind are sudden and violent; and the barometer is not observed to fall. The direction of the eddy of the whirlwinds, especially when the diameter is very small, differs from the rotation of winds in a storm, in that it may take place either way—right to left, or left to right—according to the direction of the stronger of the two winds which give rise to the whirlwind. Thus, suppose it to arise from a n. wind blowing side by side with a s. wind, and to the w. of it, then, if the n. wind be stronger, the whirl will be n. w., s., and e.; but it will be in a contrary direction if the s. wind be the stronger. Whirlwinds often originate within the tropics during the hot season, especially in flat sandy deserts; these becoming unequally heated by the sun, give rise to ascending columns of heated air. In their contact with each other, the ascending currents result in eddies, which draw up with them large clouds of dust, and the whole is borne forward by the wind that may happen to be blowing at the time. This is the origin of the *dust whirlwinds* of India, which have been admirably described and illustrated by P. F. H. Baddeley. These dust-storms are frequent in dry warm regions; and in the case of the *simoom* (q.v.), which may be regarded as a succession of such whirlwinds, they appear on a scale of the most appalling grandeur.

Extensive fires, such as the burning of the prairie in America, and volcanic eruptions, also cause whirlwinds, by the conflicting currents of heated air they occasion; and these, as well as the whirlwinds already mentioned, are generally accompanied with heavy rains, hail, and electrical displays. Whirlwinds are also of frequent occurrence in France, doing great damage to the vineyards and other crops; but in Great Britain they seldom occur.

Waterspouts are whirlwinds occurring on the sea or on lakes. When fully formed they appear as tall pillars of cloud stretching from the sea to the sky, whirling round their axes, and exhibiting the progressive movement of the whole mass precisely as in the case of the dust-whirlwind. The sea at the base of the whirling vortices is thrown into the most violent commotion, resembling the surface of water in rapid ebullition. It is a popular fallacy that the water of the sea is sucked up in a solid mass by waterspouts, it being only the spray from the broken waves which is carried up. Observations of the rain-gauge conclusively prove this.

What are sometimes called *waterspouts on land* are quite distinct from these phenomena. They are merely heavy falls of rain of a very local character, and may or may not be accompanied with whirling winds. They generally occur during thunderstorms, being quite analogous to severe hail-storms, from which they differ only in point of temperature. Also all the moisture that falls is the result of condensation; whereas, in the true waterspout the rain is mixed with spray which has been caught up from the broken waves, and carried aloft by the ascending currents of the whirlwind.

WHIS'KY (Gaelic, *uisge*, water; *uisge-beatha*, commonly written *usquebaugh*, water of life), a spirit made by distillation from grain, roots, and other materials, the best being produced from barley after it has been malted, though what is termed raw grain whisky (made from wheat, oats, rice, rye, Indian corn, buckwheat, millet, etc.), after being kept for two or three years, is scarcely inferior in quality. Whisky is also made from beet-root, potatoes, beans, molasses, sugar, etc. In these cases malt is used to a small

extent. The mode of manufacture is described under DISTILLATION. Whisky was formerly almost exclusively manufactured in Scotland, Ireland, and the United States; but distilleries are now at work largely in England, Prussia, Sweden, France, Holland, and Belgium, the foreign spirit being, however, coarser, and only suited for fortifying wines and for methylated spirit for manufacturing purposes. According to the statistics for 1871 there was distilled in Scotland 13,813,062; in Ireland, 9,302,253; and in England 7,739,720 gallons. In 1881–82 duty was paid in England on 13,868,006 gallons; in Scotland on 8,620,255; and in Ireland on 7,192,329. The largest quantity is always made in Scotland; but owing to a large quantity of the spirit being removed to England duty free, to be converted by English rectifiers into British gin, duty is paid on it in England. Scotland sends to England, in excess of the quantity returned from that country, about 3½ millions, and Ireland sends upward of a million gallons annually.

In 1858, the duty on spirits was equalized in the three kingdoms, thus putting a stop to the systematic and (as was found) irrepressible practice of smuggling spirits from Scotland and Ireland into England, which had prevailed for a long time previously. The duty was in 1860 raised to 10s. per imperial gallon, at which rate it still remains. This rate was increased to its present value by Mr. Gladstone with the avowed intention of diminishing the consumption of ardent spirits; and though it does not seem to have produced this effect, neither has it, as was always the case formerly, increased the practice of illicit distillation, owing to the improved moral tone of the population, the more thorough execution of the law, and the great capital embarked in the distilling trade acting as a deterrent against fraudulent distillation on any extensive scale. Illicit distillation is now very much on the decrease, and is almost confined to Ireland. The high price of whisky, besides limiting its consumption, has had a deleterious effect in increasing the temptation to produce a cheaper drink for the poorer classes by introducing noxious materials resembling it in effect and flavor. In years when the vine crop in France is a failure, large quantities of whisky are sent to that country, and returned as French brandy. In the United States the process of manufacture is the same as in this country, and is largely carried on in New York, Pennsylvania, Ohio, Illinois, Indiana, Kentucky, and, in a less degree, in Tennessee, Missouri, and California. A large quantity is also rectified, and reduced to alcohol, and much is exported and in part returned in the form of "French brandy," "Hollands," etc. The "Monongahela" whisky of Pennsylvania, and that from Bourbon county, Kentucky, are considered the best in the United States.

The quantity of grain consumed in the U. S. in 1884, in the production of spirits, amounted to 18,927,982 bush., being about 3,000,000 more than the number used in 1883. The average consumption for the last five years has been 24,065,879 bush., and the average yield per bush. has been a little more than 3.8 gals. The number of grain distilleries in operation during the year ending 1884, June 30, was 1078, being a small decrease from the number operated in 1883. The tax on spirits distilled from grain, etc., was $67,951,906 in 1883, and $70,631,860 in 1884. There was produced and bonded in 1884, of Bourbon whisky, 8,896,832 galls.; of rye, 5,089,958. 1884, June 30, the bonded warehouses contained 41,177,059 galls of bourbon, and 15,005,057 of rye whisky. There was exported in 1884, 3,401,410 galls. of bourbon and 710,858 galls. of rye. The internal revenue tax on whisky is 90 cents per proof gallon.

WHISKY INSURRECTION. A series of revolts in Western Pennsylvania against the execution of excise laws, culminating in an extensive uprising in 1794. The main causes of revolt were, first, the inherent dislike of a free people to excise laws with their necessary adjunct of power to inspect private property; second, the comparative freedom from legal restraint which their remoteness had hitherto secured to the western counties; third, the difficulty of shipping grain from these counties except in the portable form of Whisky, which made the excise seem an unjust discrimination against them; fourth, political opposition to the exercise by the United States of a power clearly conferred upon it, but not previously exerted.

The first excise law was passed March 3rd, 1791, and arose from political necessity. The advocates of states' rights were fast gathering power and Secretary of the Treasury Hamilton urged upon President Washington the importance of demonstrating the Federal Government's authority. The excise seemed so plainly within the Constitution that a valuable precedent might be established through it without dangerous opposition.

Considerable political excitement followed the law, and in September a customs collector was tarred and feathered. The agitation smoldered throughout the winter. In May, 1792, Congress empowered the President to call out the militia, and fresh acts of violence in August forced him to issue a warning proclamation, but it was not until 1794 that further measures became necessary. One source of complaint was the sole jurisdiction of Federal Courts in excise cases, obliging prisoners to go for trial to Philadelphia. Finally in June, 1794, jurisdiction was granted to state courts, but in July, fifty writs, issued under the old law, were served around Pittsburgh. A mob followed the marshal, crying that he was "carrying off men to Philadelphia;" great excitement prevailed, mails were robbed, the inspector's house was burned, and on August 1st over 7700 people assembled at a mass meeting at Parkinson's Ferry. Under these circumstances, upon Gov. Mifflin, of Pennsylvania, declining to take the initiative, Washington issued a proclamation ordering the insurgents to dis-

perse, and sent a requisition to the Governors of Pennsylvania, New Jersey, Virginia, and Maryland, for 15,000 militia. Meanwhile a commission, offering amnesty on full submission, returned without having accomplished anything. The troops started Sept. 1st, Washington accompanying them to Carlisle, where he placed Gov. Lee, of Virginia, in command. Meanwhile the news of their advance had its effect upon the insurgents, and another convention was held, Oct. 2nd, to pass resolutions of submission.

Commissioners were dispatched and courteously received by Washington at Carlisle, who, nevertheless, did not stop the troops.

On arrival in the disturbed districts Gov. Lee issued a proclamation of amnesty, requiring an oath of allegiance from the inhabitants, and a few days later made a general seizure of suspected persons. Many were dismissed on trial for want of evidence, and many others pardoned. The leaders had either fled or taken advantage of the amnesty. The insurrection was virtually crushed, but as a precaution 2500 men were left encamped in the neighborhood all winter. Not only had an extensive rebellion dwindled into insignificance, but by the President's promptness, another of those foundation stones was laid upon which the structure of our national government has been erected.

WHIST, a game at cards, believed to be of English origin; probably a development of the game of *trump* (or, more properly, *triumph*), which was played in England at least as early as the time of Henry VIII. Trump (or triumph) is mentioned in a sermon delivered by Latimer on the Sunday before Christmas, 1529. The game of trump is also mentioned by Shakespeare punning on the word triumph (see Douce's *Illustrations*, and *Antony and Cleopatra*, act iv. scene 12). The game of whist is not mentioned by Shakespeare, nor by any writer of the Elizabethan era.

The earliest mention of *whist* (or, more properly, *whisk*) is in the poems of Taylor the water-poet (1621). In the first edition of Cotton's *Compleat Gamester* (1674), whist has no place; but it is added in the second edition (1680) as a game "commonly known in England." Cotton says that "the game of whist is so called from the silence that is to be observed in the play;" and this derivation of the word has been generally accepted, and was adopted by Dr. Johnson, to the extent of explaining whist to be a game requiring silence. But if the original name of the game was whisk, Cotton's derivation fails. The derivation from an interjection signifying silence seems to have been taken for granted somewhat hastily.

The game was formerly played nine-up. The change to ten-up seems to have taken place in the first quarter of the 18th century. Whist played ten-up is called *long whist*. About 1785 the experiment of dividing the game into half was tried, and *short whist* was the result. The short game soon came into favor; and in 1864 the supremacy of short whist was acknowledged by nearly all the London and by many country clubs, the clubs adopting as their standard the laws of short whist as framed by committees of the Arlington and Portland.

Edmond Hoyle, the first writer of any celebrity on whist (commonly called the father of the game), was born in 1672—it is said in the neighborhood of Halifax, Yorkshire, but on insufficient grounds. He was educated as a barrister. He first published his *Short Treatise* about 1742. He used to give lessons in whist at a guinea a lesson. His *Short Treatise* ran through many editions (16 or more) during his lifetime; and since his death his works have been reproduced in numberless ways. Hoyle died in Welbeck street, Cavendish square, on Aug. 29, 1769, aged 97.

The game of whist is played by four person, two being partners against the other two. The partners sit opposite to each other. The partnership is determined by cutting. The two lowest are partners against the two highest, and the lowest has the deal and the choice of seats and cards. In cutting, the ace is reckoned lowest. Each player has a right to shuffle the pack once before each deal, the dealer having the privilege of a final shuffle. The shuffling being concluded, the player to the dealer's right cuts the pack. The dealer, having reunited the packets, is bound to deal the cards one at a time, to the players in rotation, beginning with the player to his left. He turns up the bottom card (called the trump card). The deal being completed, the players sort their cards, and the player to the dealer's left (or leader) plays a card face upward on the table. The other players follow in rotation, being bound to follow suit if they can. When all have played, the trick is complete. It is then gathered and turned over by the winning side. The highest card wins the trick. The ace is highest in playing; and the other cards reckon in the order, king, queen, knave, ten, etc., down to the deuce, or two, which is lowest. If any player cannot follow suit (i.e., has none of the suit led), he may play any card he pleases. If he plays a card of the suit turned up (called trumps), he wins the trick, unless another player also, having none of the suit led, plays a higher trump. The player who wins the trick becomes the leader for the next trick, and so on till the whole hand (consisting of 13 tricks) is played out.

After scoring, the mode of which will be presently described, the player to the last dealer's left deals in his turn; and in subsequent deals, each player deals in turn, the rotation going to the left.

After the hand is played out, the scoring is thus performed: The side who win more than six tricks reckon one for each trick above six; and the side who either separately or conjointly hold more than two of the following cards, ace, king, queen, and knave of trumps (called honors), reckon as follows: If they hold any three honors, they score two (that being the excess of their honors over their opponents); and similarly if they hold four honors, they score four. At short whist, players who are at four, cannot score

honors. The same at long whist with players who are at nine. The side who thus in one hand or in a succession of hands first reach five at short whist, or ten at long, score the game.

A game at short whist is called a single if the adversaries have already scored three or four; a double if they have scored one or two, a treble if they have scored nothing. A game at long whist is a single if the opponents have scored five or more; a double if they have scored less. There is no treble at long whist.

A rubber consists of the best two games out of three. If the same players win two consecutive games, the third is not played. The winners of the rubber win in points the value of the games they have won, and where the rubber has consisted of three games, the value of the loser's game is deducted. And whether two or three games are played, two points are added for the rubber at short whist; one point for the rubber at long. Thus, if at short whist A B (partners) win a single and a double, they win three points on the games, and they add two for the rubber, making five points. Had A B won the same, but C D (their opponents) won a treble, they would have to deduct three points, the value of the opponents' game, and would only win two points. Long whist is now seldom played.

Whist is a mixed game of chance and skill. The chance resides in the holding honors, and the fortune of having high cards dealt in the hand. The skill consists in the application of such knowledge as shall, in the long run, turn the chances of the cards in the player's favor. At the commencement of the hand, the first lead presents a problem of almost pure chance; but as the hand proceeds, observation of the fall of the cards, inference therefrom, memory and judgment, come in, so that toward the end of the hand we are often presented with a problem of almost pure skill. It is these ever varying gradations of skill and chance that give the game its chief interest as a scientific pastime.

In order to become a skillful player, it is necessary to bear in mind that the game is not one of any given player's hand against the other three, but a combination of two against two. In order that two partners shall play their hands to the best advantage, they must strive, as much as possible, to play the two hands as though they were one. To this end, it is advisable that they should pursue some uniform system of play, in order that each partner shall understand the plans of the other, and so be placed in the most favorable position to assist him in carrying them out. The experience of the last hundred years has developed a system of play tending to this result. Of this we proceed to give an epitome.

The first, or, as it is commonly called, the *original* lead should be from the player's strongest suit. A strong suit is one that contains either a large number of cards (four or more) or several high cards. The suit containing the largest number of cards (numerical strength) is the one to be mostly preferred. The object aimed at in opening with the strongest suit is to exhaust the cards of that suit from the other hands. When this object is accomplished, the cards of the suit which remain in the leader's hand (called long cards) obtain a value which does not intrinsically belong to them. They often become of great service, for when led, they either compel the adversary to trump, or they make tricks. And when trumps are all out, the player who has the lead makes as many tricks as he has long cards.

On the other side, by opening weak suits, there is considerable risk of sacrificing partner's strength, and of leaving long cards with the opponents.

Some players are prone to lead single cards, but experience shows that weak leads, as a rule, do more harm than good. Sometimes a trick or two is made by playing a trumping game; but the chances are that such tactics sacrifice partner's hand, and clear the suit for the adversaries.

The proper card of the strong suit to lead is, as a rule, the lowest. The intention is for the third player to play his highest, and so to assist in clearing his partner's strong suit. Moreover, if the leader keeps the best cards of his suit in his own hand, he has a fair chance of getting the lead again when his suit is nearly or quite established. But with ace and four or more small ones, it is considered best to begin with the ace, lest the ace be trumped, second round. Also, with a strong sequence in the strong suit, it is best to lead one of the sequence first, lest the adversaries win with a very small card. The following are the principal leads from sequences:

From ace, king, queen—lead king, then queen.
From ace, king, and small—lead king, then ace.
From ace, queen, knave—lead ace, then queen.
From king, queen, knave, and more than one small—lead knave.
From king, queen, knave, and one small—lead king.
From king, queen, and small—lead king.
From king, knave, ten, nine, etc.—lead nine.
From king, knave, ten, and small—lead ten.
From queen, knave, ten, and small—lead queen.
From knave, ten, nine, and small—lead knave.

After the first trick, the lead may remain with the first leader. His best play, as a rule, is to continue his suit. If the lead falls to another player, his play, as a rule, will be to open his best suit; and so on. If the lead falls to the first player's partner, he has

choice of two modes of play. If he has a good strong suit of his own, as, for instance, one of those in the list above, and containing four or more cards, he would, as a rule, open it; if not, he would, as a rule, do well to continue the suit his partner first led; or, as it is commonly called, to return his partner's suit. The object is to strengthen partner by assisting to clear his strong suit.

In returning a suit, if the player has only two cards of it remaining in his hand, he should return the highest; if more than two, the lowest. The exception is, if he has the winning card, he should return that irrespective of the number of other cards in the suit. The reason of this rule is that, with but two cards of the suit remaining, the player is weak in the suit, and he is therefore bound to sacrifice his good card to support his partner. But with three or more remaining after the first round, he is strong, and is therefore justified in calling on partner to support him.

This rule of play is most important. It should be carefully observed with even the smallest cards, as it enables partner to count the situation of the remaining cards. For example: A leads a suit in which C (his partner) holds ace, three, and two. In returning A's suit, after winning with the ace, C is bound to return the three and not the two. When C's two falls in the third round, A will know that his partner has no more of the suit. But suppose C's cards to be ace, four, three, and two. In returning the suit, C is bound to choose the two. Then after the third round, A will conclude with certainty that C has at least one more card in the suit.

Late in a hand, the considerations with regard to the lead vary. If there is no indication to the contrary, it is best for each side to continue the suits originally opened by them. But the fall of the cards may show that it is disadvantageous to persevere in the suits first led. In such cases, the player must have recourse to other and weaker suits. The general rules to be observed here are—to choose a suit in which there is reason to infer that the right-hand adversary is weak; or—but this is less favorable—one in which the left-hand adversary is strong. In either case, if the suit chosen contains but three cards, none higher than knave, or only two cards, it is generally right to lead the highest.

The second player, as a rule, should play his lowest card, in order to preserve his strength in the leader's suit. The first trick in the suit is left to partner, who has an even chance of holding a better card than the third player. But if the second hand has a strong sequence, he should play the lowest of the sequence, by which partner's hand may be saved, and a high card still remain over the original leader.

The following are the principal sequences:

With ace, king, queen—play queen.
With ace, king, etc.—play king.
With king, queen, knave—play knave.
With king, queen, etc.—play queen,
With queen, knave, ten—play ten.
With queen, knave, and one small—play knave.

When a high card is led, it is sometimes advisable for the second player to cover it with a higher one. The shortest rule is to put an honor on an honor, if with but two or three cards of the suit. With king or queen, and four of the suit, it is better to pass an honor led.

When the second hand has none of the suit led, he should, as a rule, trump, if he has but two or three trumps; but he should not trump a losing card if he has more than three trumps.

The third hand, as a rule, plays his highest card in order to support partner in his suit. The exceptions are, with ace, queen, etc., the queen is to be played; and if partner has begun with a high card, it is often right to pass it.

The management of trumps varies according to whether the player is strong or weak in them. If strong (i.e., with four or more), they should not be used for trumping, if it can be avoided, but should be kept together, in hopes of establishing a suit, and of remaining with the long trump, with which to get the lead after the other trumps are out, and so to bring it in. Thus, if the opponents lead a losing or doubtful card, it is better, as a rule, not to trump it when holding four trumps. But if the opponents lead a winning card, it is, as a rule, better to trump it, though holding four trumps, than to pass it in hopes of bringing in a suit.

With five trumps, the chance of succeeding in exhausting the opponents' hands, and of remaining with the long trump, is so considerable, that a player having five or more trumps, should lead them; and as number is the principal element of strength, he should not be deterred from leading trumps merely because the fourth hand has turned up an honor.

With four trumps only, it is better first to lead the strong suit. When the adversaries' hands are cleared of that suit, or so far cleared that the holder of the long cards in that suit commands it, it is, as a rule, safe to lead from four trumps.

As a rule, less than four trumps should not be led from. But a player is justified in leading from weak trumps, if he holds winning cards in every suit; if the adversaries are both trumping a suit; or if the game is lost, unless partner has strength.

It is most important to return partner's trump lead at once, unless he has led from

weakness; for partner, by leading trumps, declares a strong game, and it is then the best policy to abandon one's own plans, and to support his.

It follows that a player should not, as a rule, lead a card for his partner to trump, unless he has four or more trumps; for with less than four trumps, the player is weak, and if he forces his partner to trump, partner is weakened also; and the chances are that by weakening partner under such circumstances, the command of trumps will remain with the adversaries.

But a player may force his partner, although weak himself, if partner has already been forced, and has not afterward led trumps; if partner has already declared weakness in trumps, as by trumping a doubtful card second hand; if two partners can each trump a different suit; and when one trick from partner's hand wins or saves the game.

The same considerations which make it inexpedient to force partner when weak one's-self show the advantage of forcing a strong trump hand of the opponents.

There are yet some general rules of play which have not been explained.

The second, third, and fourth players should always play the lowest of a sequence. The rule here given is in conformity with the play that would naturally be adopted in playing cards that are not in sequence; and by keeping to a uniform plan, players are enabled to infer what cards their partner does or does not hold. It is true that the adversaries often gain the same information; but it is found by experience that it is of more advantage to inform partner than to deceive the opponents.

As a rule, it is advisable to lead out the winning cards of partner's suit. The presumption is that he has led from his strong suit; and by leading out the winning cards, the suit is cleared for him, and his long cards are not obstructed. The reverse applies to suits led by the adversaries. It is mostly right to retain the winning cards of such suits as long as possible, in order to stop the establishment of them.

When a player has none of the suit led, he should, as a rule, throw away from his weakest suit; for by discarding from a strong suit, its numerical power is damaged. But when the adversaries have shown great strength in trumps, it is not advisable to keep small cards of a long suit, as it is not likely that it can ever be brought in. Under such circumstances, the player should throw away from his best protected suit, and keep guards to his weaker ones.

Players should watch the cards as they are played, and endeavor to infer from them where the others lie. Thus, if a player wins a queen with an ace, it may be inferred that he has not the king, the rule being to win with the lowest; if a player leads trumps at starting, it may be inferred, as a rule, that he is strong in trumps, or has a very fine hand. By recording in this way, and by counting the number of cards played in each suit, skilled players will often, toward the close of a hand, know the position of all the important cards remaining in; and by means of this knowledge, they will be able to play the end of the hand to the same advantage as though they had seen all the cards.

And lastly, and most important of all, players should play to the score. Thus, wanting but one trick to save or win the game, a winning card should be played at once. The example is stated as for one trick; but it should always be kept in mind how many tricks are requisite to win or save the game, or even a point, and the play should be varied accordingly.

In America the most popular style of this game is one of seven points, in which honors are not counted. A great many players no longer give the dealer an advantage by cutting for a trump, but it is named, before the cards are dealt, by the player on the dealer's left. The trump signal, popular in England for so many years, is now coming into universal use. In consists in discarding an unnecessarily high card on the first lead and afterwards a lower one. This signifies that the person so playing desires trumps to be led, to which his partner must respond at the earliest opportunity by leading out the best trump in his hand, and if that takes, the next best, and continue. A new method of leading has come into vogue into the U. S. of late, which consists of ignoring small cards when leading from a long suit, and leading as would be done with the four higher cards in hand. The result is that upon the close of the second round all the players are informed of the whereabouts of the small cards. But it is disputed whether this general knowledge is an advantage to the dealer or not. The methods of play laid down in the main article are still in vogue; but judgment must be exercised in attempting to establish a strong suit; it must not be attempted at all hazards, and with a weak hand it is often better to play a defensive game. See *American Whist* (revised ed., 1886).

WHISTLER, James Abbott M'Neill, b. Lowell, Mass., 1834; was educated at West Point; went to England abt. 1855, where he studied art, and then studied in Paris under Gleyre. He settled in London, 1863, and has exhibited paintings and etchings at the Royal acad., etc., and the Hague, and at the Paris salons. He removed to Paris in 1892. His etchings are universally praised, but his paintings are both abused and admired. Among his pictures that have been exhibited are "Wapping," "Old Battersea Bridge," "The White Girl," "Sea and Rain," and a number of paintings which he styles nocturnes, arrangements, symphonies, and harmonies in different colors. His paintings evince talent and originality, though some critics declare them to be incomprehensible. He has painted portraits of Carlyle, Sarasate, etc. He has published *Ten O'Clock* (1888); *The Gentle Art of Making Enemies* (1890).

WHISTON, William, was b. Dec. 9, 1667, at Norton, in Leicestershire, of which place his father was rector. His earlier education he received at home; subsequently, he be-

came the pupil of a Mr. Antrobus at Tamworth, and finally he went to Cambridge, where he greatly distinguished himself, chiefly as a student of mathematics. In 1690 he took his degree, and obtained a fellowship in 1693. The year after he became chaplain to Dr. More, bishop of Norwich; and in 1698, having been presented to the living of Lowestoft, in Suffolk, he was married to Miss Antrobus, the daughter of his old preceptor, his fellowship being thus forfeited. Meantime, in 1696, had appeared his *Theory of the Earth*, a work which, despite, or perhaps in virtue of, the oddity of certain of its speculations, procured him a considerable reputation. That his genuine claims as a man of science were considerable, is made clear by the fact that in 1703, by the express influence of sir Isaac Newton, whose acquaintance he had made some years previously, he was appointed to succeed him in the Lucasian professorship at Cambridge. On receiving this appointment, he gave up his living, and again settled himself at the university. In addition to the duties of his chair, he engaged in clerical work; and such was his success as a preacher, that he would probably have attained high position in the church, had not the development of his theological opinions led him into Arian heresy —his frank and fearless avowal of which at once in his preaching and his writings led, in 1710, to his expulsion from his professorship and the university. In the same year appeared the most noted of his original writings, *An Historical Preface to Primitive Christianity Revived*. His subsequent prosecution in the church courts forms a curiously complicated chapter in the history of such matters. The result was, that after five years of vexatious suspense, during which the proceedings swayed hither and thither in the strangest way, they proved in the end abortive, and Whiston was permitted to remain formally a member of the church of England. By many of the clergy, however, much dissatisfaction was expressed; the famous Dr. Sacheverel in particular thundered from the pulpit against the delinquent, and refused to admit him to communion—an example which was followed by others. It seems significant of the social stigma attached to him in the minds of the orthodox, that when Halley, in 1720, proposed him as a member of the royal society, his old friend Newton successfully opposed his admission. Whiston himself, the most amusingly vain of men, remained indeed deeply convinced that Newton's conduct was dictated by jealousy of his superior scientific genius—a notion in which he probably found not many to agree with him. Having no ostensible means of livelihood, Whiston was frequently reduced to great straits; but he had kind friends, who were ready to assist him at need. In the dissemination of his religious opinions he continued unwearied; his publications on the subject were numerous; also, he occasionally delivered lectures; and he instituted a religious society, which had meetings at his own house. He also busied himself much with scientific crotchets, chief among which was a scheme for calculating the longitude, of the success of which he was assured. He died on Aug. 22, 1752, at the great age of 85. Of all his numerous works, a translation of Josephus was the only one which continued for a time to perpetuate the name of its author; and of this there have been several reprints. His memoir of his own life (published in his lifetime in 3 vols. 1749–50) is a curious specimen of self-portraiture.

WHITAKER, Daniel K., ll. d., b. Mass., 1801; graduated at Harvard, 1820; studied law, and settled in South Carolina and became the law partner of ex-governor Wilson of that state. He is best known as the founder and editor of the *Southern Literary Journal*, *Whitaker's Magazine*, and the *Southern Quarterly Review*. The last was started in 1841, and for twenty years had a high reputation. In 1866 Mr. Whitaker became editor of the *Monthly Review*, published at New Orleans. D. 1881.

WHITAKER, Nathaniel, d. d., 1732–95; b. N. Y.; graduated Princeton college under president Burr; was ordained and settled over the Congregational church at Norwich, Conn. In 1765 he visited Great Britain with the Rev. Samson Occum to procure funds for the support and enlargement of the school at Lebanon, Conn., under the care of the Rev. Eleazar Wheelock. They were cordially received in England and Scotland, and obtained £12,000. This school, established for the education of the Indians, was in 1770 removed to Hanover, N. H., was chartered by Governor Wentworth under the name of a college, and called Dartmouth in honor of lord Dartmouth, who had generously contributed to the American agents for the Indian school. Dr. Whitaker on his return was settled at Salem, Mass., and Norridgewock, Me.

WHITAKER, Ozi William, d.d., b. Mass., 1830; graduated Middlebury college, 1856; principal of the North Brookfield high school for several years; studied theology at the Protestant Episcopal seminary, New York; rector of St. John's church, Gold Hill, Nev., 1863–65; of St. Paul's, Englewood, N. J., 1865–67; of St. Paul's, Virginia, Nev., 1867; missionary bishop of Nevada and Arizona, 1868; assistant bishop, diocese of Pennsylvania, 1886; bishop, 1887.

WHITBY, a parliamentary borough, market t., and thriving seaport in the north riding of Yorkshire, on both sides of the mouth of the Esk, 56 m. n.n.e. of the city of York by railway. A stone bridge with a swivel, by which vessels are admitted into the inner harbor, connects the two parts of the town. Two piers, of which the w. one is about 1000 ft. long, run out into the German ocean, and protect the outer harbor, and it is further protected by two inner piers, which break the force of the waves during storms. Pop. '81, 14,554; '91, 13,274.

WHITE, a co. in central Arkansas, having the White river for its e. boundary, drained by Little Red river and Bayou des Arc; 1137 sq.m.; pop. '90, 22,946. Co. seat, Searcy.

WHITE, a co. in extreme n.e. Georgia; 170 sq.m.; pop. '90, 6151. Gold is found in considerable quantities. Co. seat, Cleveland.

WHITE, a co. in s.e. Illinois, drained by the Wabash river, separating it from Indiana, and also by the Little Wabash; 500 sq.m.; pop. '90, 25,005. Co. seat, Carmi.

WHITE, a co. in n.w. Indiana, drained by the Tippecanoe river; 500 sq.m.; pop. '90, 15,671. Co. seat, Monticello.

WHITE, a co. in central Tennessee, having the Caney fork of Cumberland river for its s. and s.w. boundary; 390 sq.m.; pop. '90, 12,348. Co. seat, Sparta.

WHITE, Andrew Dickson, ll.d., b. N. Y., 1832; educated at Yale college, and the university of Berlin. He was professor of history and English literature at the university of Michigan, 1857–62, and was president of Cornell university from 1866–85. He was a member of the N. Y. state senate in 1863–66, one of the commissioners to San Domingo in 1871, and minister to Germany, 1879–81, and again in 1897. Among his works are *Lectures on Mediæval and Modern History* (1861), *Studies in General History* (1865), and *The Warfare of Science* (1876).

WHITE, Gilbert, author of the *Natural History and Antiquities of Selborne*, was b. at Selborne, in Hampshire, on July 18, 1720. Educated at Oriel college, Oxford, he received his m.a. degree in 1746, and in 1752 he was made a senior proctor of the university. At an early period of his life he retired to his native village, to indulge his taste for literature and natural history; and there he died on June 20, 1793. His charming *Natural History and Antiquities of Selborne*, which has made White an indisputable English classic, was published in 1789. Probably no book on natural history has been more frequently reprinted. Among the various editions may be mentioned that of Professor Bell (1877), and the one by Frank Buckland, with a chapter on antiquities by lord Selborne (1875). After White's death, Dr. Aikin published a selection from his natural history journal, under the title *A Naturalist's Calendar*.

WHITE, Henry Kirke, was b. on Mar. 21, 1785, at Nottingham, in which place his father was a butcher. At the age of 15 he was apprenticed to an attorney; and, while in his business he showed exemplary diligence, his leisure hours were passionately devoted to intellectual pursuits, and especially to the cultivation of poetry. He also became a member of a literary society in Nottingham, and began to attract notice by his fluency and ability as a speaker. To the *Monthly Mirror* he was wont to send contributions, and the merit of his verses drew to him the attention of Mr. Hill, its proprietor. Acting on the advice of this gentleman and Mr. Capel Lofft, who also took a generous interest in him, he published in 1803 a small volume of poems, which was cruelly treated by the critics, and found little acceptance with the public. It was the means, however, of securing him influential friends, notably Southey, and the rev. Mr. Simeon, through whose influence a sizarship in St. John's college, Cambridge, was procured for him. In his studies he highly distinguished himself; but the ardor with which they were pursued speedily proved the ruin of a constitution at all times delicate; consumption rapidly developed itself, and he died Oct. 19, 1806. The year after two volumes of his *Remains* were published by his friend Southey, to whom his MSS. had been intrusted, prefaced by a pleasing memoir of the deceased poet. White's poetry, however, is now almost forgotten.

WHITE, Horace, editor, was born at Colebrook, N. H., in 1834; removed with his family to the west; graduated at Beloit College, Wis.; was editor of the *Chicago Tribune* 1864–74; and since 1883 has been assistant editor of the *New York Evening Post*. He edited Bastiat's *Sophismes Économique* (1869), and *Cossa's Scienza delle Finanze* (1888). His style is trenchant and convincing.

WHITE, Hugh Lawson, 1773–1840, lawyer and statesman, was born in North Carolina, and removed with his parents when very young to Tennessee, where his educational facilities were very meagre. He was in the Indian war in 1792, probably deciding the events of the battle at Etowah, by killing the leading chief, Kingfisher, which caused the Indians to flee in dismay. After the war he studied in Philadelphia, read law in Lancaster, Pa., and began practice in Knoxville, Tenn., in 1796. From this time until 1825 he occupied many and important positions under the state government. In the latter year he was elected U. S. Senator to fill the vacancy caused by the resignation of Gen. Andrew Jackson. He favored Jackson in many of his measures, but in 1835 made a stirring speech in favor of limiting executive patronage. (Jackson removed 690 public officials during his administration, while the entire number removed from 1790–1829 had been 74). This speech was regarded as an attack on the administration, and the breach was further widened by his opposition to Benton, who offered a proposition to erase from the records certain resolutions of censure that had been passed against the President. Judge White had voted against the resolutions when offered, but he considered the effacement from the records as unconstitutional, and desired, instead, that they be simply "rescinded and declared null and void." This caused a complete rupture between White and the President, and in 1836 White received the electoral votes of Tennessee and Georgia for President. In 1839 he resigned his seat in the senate because

he received instructions from the legislature to vote against his better judgment. See a *Memoir, with Selections from His Speeches and Correspondence* (1856).

WHITE, Rev. Joseph Blanco, was b. at Seville, in Spain, on July 11, 1775. His father was a merchant there of Irish parentage, who had married a Spanish lady of old Andalusian family. Finding his father's counting-house on trial not at all to his mind, he quitted it to prepare himself for holy orders, and in 1799 he was ordained a priest. But, born with a mind curiously restless and inquisitive, he ceased in no long time to find himself at home in the Romish communion; and in 1810 he came to England, which he never afterward quitted. Joining himself to the English church, he seems to have meditated becoming one of its clergymen; an intention which it was quite as well he did not carry out, inasmuch as his speculations rapidly led him to results not recognized by English orthodoxy. On coming to England he settled himself in London, where for some years he conducted a monthly Spanish paper called *El Español.* On the cessation of the peninsular war, in 1814, this publication ceased also, as having no longer a *raison d'être;* but meantime its services to the government of the day had been such as to secure for its editor a pension for life of £250 per annum. Subsequently Mr. White lived chiefly in London, employed as a man of letters. Though in literary circles recognized as a man of fine talent, and known as a contributor to the *Quarterly* and *Westminster Reviews,* and other high-class periodicals, he scarcely succeeded in making a permanent impression on the public by any of his more formal publications. Of these the most important were: *Letters from Spain* (1822), contributed some years before to the *New Monthly Magazine; Practical and Internal Evidence against Catholicism* (1825); *Poor Man's Preservation against Popery* (1825); and *Second Travels of an Irish Gentleman in Search of a Religion* (2 vols. 1833). He died on May 20, 1841, in Liverpool, whither he had removed some years before. In 1845 there was given to the world, as his legacy to it, by much his most striking and valuable work, *The Life of the Rev. Joseph Blanco White, written by himself, with portions of his Correspondence;* edited by John Hamilton Thom (London, 3 vols. 8vo).

WHITE, John Blake, 1781–1859; b. S. Car.; studied art in London under Benj. West. He practised law in Charleston, painting as an amateur. His pictures are much prized, especially those on historical subjects, such as "Gen. Marion inviting the British Officer to Dinner in the Pedee Swamp," "Mrs. Motte urging Gen. Marion in order to dislodge the British," "The Battle of Ft. Moultrie," "Rescue of American Prisoners by Sergeant Jasper and John Newton," "Massacre of American Prisoners by the English and Indians at Frenchtown," "The Battle of Eutaw Springs," "The Martyrdom of Hayne," "Gen. Marion and his men fording the Pedee," "Battle of New Orleans," "Capture of André," "Unveiling of the U. S. flag in the City of Mexico," etc.

WHITE, Peregrine, 1620–1704; the first English child born within the limits of New England. His birth was on the *Mayflower,* in Cape Cod harbor, Nov. 20, 1620. After his father's death his mother married Gov. Edward Winslow, this being the first marriage in New England. It is recorded that Peregrine was "vigorous and of a comely aspect." He held several military and civil offices, and died at the good old age of 84 years.

WHITE, Richard Grant, 1821–85; b. New York: educated at the univ. of New York, and began in the law, but soon devoted himself entirely to newspaper and literary work, and especially to the study of the English language. His most important work is his *variorum* edition of Shakespeare, containing also a memoir and a critical essay (1857–65). Among his works are: *Shakespeare's Scholar* (1854); *Essay upon the Authorship of the Three Parts of Henry VII.* (1859); *Memoirs of the Life of William Shakespeare* (1865); *Words and Their Uses* (1870); and *Every-Day English* (1880). Mr. W. was a frequent contributor to the *Galaxy,* the *Atlantic Monthly,* and other periodicals.

WHITE, William, D.D., 1748–1836; b. Philadelphia; graduated college of Philadelphia, 1765; studied theology; went to England and was ordained deacon by the bishop of London, 1770, and priest by the bishop of Norwich, 1772; returning, became rector of Christ church and St. Peter's church, Philadelphia; chaplain to congress, 1777; presided over the first Episcopal convention in America, 1789, and wrote the constitution of the church, which was then adopted; elected bishop of the diocese of Pennsylvania, 1786; consecrated at Lambeth Palace by archbishop of Canterbury, 1787. He, with bishop Seabury, revised the Book of Common Prayer for the American Episcopal church. He published *Memoirs of the Protestant Episcopal Church; Comparative Views of the Controversy between the Calvinists and the Arminians; Lectures on the Catechism.* He had a happy combination of intellectual and spiritual qualities for the office of bishop at the organization of the Episcopal church in America.

WHITECHAPEL is a district situated in the eastern suburbs of London, which was originally named from a certain chapel within its limits. In early times all distances east of London were measured from this chapel. It is now the locality of numerous sugar bakeries, generally carried on by Germans, and is inhabited mostly by artisans. London Hospital and the Tower of London are within its limits.

WHITE COLORS. The principal white pigments used by painters are: (1) *White lead* (see Lead), which is not only used as a color, but forms the body of most oil-paints; (2) *Derbyshire white,* which is sulphate of baryta; (3) *pearl white,* or trisnitrate of bismuth; and (4) *zinc white,* or hydrated oxide of zinc.

WHITE EAGLE, ORDER OF THE. This degree in Freemasonry of Knights was instituted by Vladislas V. in 1325. Its decoration is a star-shaped piece of metal, with seven points, beautifully engraved, with a shield displaying a lion rampant, and a sceptre before him, indicating the house of Judah, a well under a tree, an arrow by its side, and a bull underneath; a man in a kind of frock-coat, with both hands uplifted. At the base is a spread eagle and two harpies, evidently representing cherubim. Beneath the shield is a star with the letter J in the centre, for Jehovah, and over all the eye of Providence. The motto is, *Kodes la Adonia.*

WHITE FEATHER. A game-cock with a white feather in his tail was looked upon as not being of the true game breed, hence the expression, "to show the white feather," signifies a lack of courage.

WHITE FLUX. See FLUX.

WHITE GUNPOWDER is a mixture that was at one time employed in blasting, but is now seldom used in consequence of the danger attending its preparation, and the facility with which it explodes by friction. Its ingredients are chlorate of potash, dried ferrocyanide of potassium, and sugar.

WHITE HOUSE, THE, known also as the executive mansion, is the president's abode at Washington, D. C. It is two stories high; 176 ft. long by 86 ft. wide; built of freestone painted white, whence its name. It stands on Pennsylvania ave., about a mile from the capitol, and is surrounded by handsomely laid out grounds, about 20 acres in extent. Upon the lower floor are the reception rooms; the upper floor contains the offices of the president and his secretaries, and apartments for the family. The first president's house was built 1792–1800, and was burned by British troops, 1814. The present edifice was built 1818–29: and the cost of its erection and maintenance is computed at about $2,000,000. It is not now regarded as fitted for its purposes.

WHITE LADY, a being who, according to popular legend, appears in many of the castles of German princes and nobles, by night as well as by day, when any important event, whether joyful or sad, but particularly when the death of any member of the family is imminent. She is regarded as the ancestress of the race, shows herself always in snow-white garments, carries a bunch of keys at her side, and sometimes rocks and watches over the children at night when their nurses sleep. The earliest instance of this apparition spoken of was in the 16th c., and is famous under the name of Bertha of Rosenberg (in Bohemia). The white lady of other princely castles was indentified with Bertha, and the identity was accounted for by the intermarriages of other princely houses with members of the house of Rosenberg, in whose train the white lady passed into their castles. In the castle of Berlin she is said to have been seen in 1628, and again in 1840 and 1850. The most celebrated in Britain is the white lady of Avenel, the creation of sir Walter Scott. It was long a common belief in the Highlands that many of the chiefs had some kind spirit to watch over the fortunes of their house. Popular tradition has many well-known legends about white ladies, who generally dwell in forts and mountains as enchanted maidens waiting for deliverence. They delight to appear in warm sunshine to poor shepherds or herd-boys. They are either combing their long hair, or washing themselves, drying wheat, beating flax, or spinning; they also point out treasures and beg for deliverance, offering as reward flowers, corn, or chaff, which gifts turn in the instant into silver and gold. They wear snow-white, or half white, half black garments, yellow or green shoes, and a bunch of keys at their side. All these and many other traits that appear in individual legends may be traced back to a goddess of German mythology who influences birth and death, and presides over the ordering of the household. Still more distinctly the appellation white lady and the name Bertha point back to the great goddess of nature, who appears under various names, and who, as *Berhta* (i.e. the brilliant, shining, white), held her circuit on Twelfth-night and revealed her power. When the legend goes on to say that the Bohemian Bertha of the 15th c. promised the workmen of Neuhaus a sweet soup on the completion of building the castle, and that this soup, along with carp, is still given in remembrance of it to the poor on Maundy Thursday, we recognize again the festival dishes consecrated to Berhta, such as fish, oatmeal gruel, or dumplings, etc., which it is still customary to eat about the time of Twelfth-night and Christmas in most districts of Germany.

WHITE LEAD. See LEAD.

WHITE MOUNTAINS, a mountain-chain of New England, regarded as an outlier of the Appalachian range, commences at the headwaters of the Aroostook river, in Maine, where its first summit is mount Katahdin, and extends in a broad plateau, from 1600 to 1800 ft. high, w. by s. nearly across New Hampshire, where it has twenty bold peaks, with deep, narrow gorges, wild valleys, beautiful lakes, lofty cascades and torrents, forming the "Switzerland of America," and a favorite resort of summer tourists. Mount Washington, the highest summit in New England, 6,286 ft., has a practicable carriage-road and a hotel on its summit; Mount Adams, the second of the group, is 5,819 ft.; the lesser are named Franklin, Monroe, Jefferson, Pleasant, Madison. In the Franconia group are Lafayette, 5,269 ft., and Moosehillock, 4,790. These mountains furnish the chief sources of the Connecticut, Merrimac, and Androscoggin rivers. The rocks are ancient metamorphic, with naked granite and gneiss. The Ammonnoosuck river falls 5000 ft. in 30 m. The discovery of the White Mountains is accredited to

Derby Field, 1642. He found many crystals upon them which he mistook for diamonds, and for a long time the chain was called "the Chrystal Hills." The Indians had a great reverence for the Mts., believing them to be the abode of the Great Spirit, and rarely ascended the higher peaks, for it was reported among them that no one who scaled the sacred heights returned alive. There was a legend that the Great Spirit once bore a good chief and his spouse to the summit of the Mts., and that all the people below were destroyed by a flood. The first settlement among the Mts. was made in 1792 by a hunter and guide; in 1803 a small inn was built near the Giant's Grave, a tall mound near the Ammonoosuc river, but it was not until 1852 that hotels began to be erected. The first bridle-path to the summit of Mt. Washington was cut, 1819; in 1820 a small party of gentlemen slept upon the summit of Mt. W. and named the different peaks. The railroad by which the top of Mt. Washington is now reached has a grade of 3,625 ft. in three miles. For several years the summit has been occupied during the winter as a station of the meteorological dept. of the U. S. army. The winds have been known to attain a velocity of 100 m. an hour, and the thermometer has sunk to 59° below zero. The Mts. are becoming more and more popular as a summer resort on account of their delightful temperature, and wild and beautiful scenery. There are five notches or passages through them: the White Mt. Notch, through which the Saco river passes, is 1914 ft. high, 2 m. long, and only 22 ft. wide at its narrowest point; the Franconia Notch, famous for its narrow water-ways, is 2014 ft. high; and the Pinkham Notch is 2018 ft. high; the other notches are the Grafton and Dixville. There are many water-falls, some of them of great beauty; among the most famous are, the falls of the Ammonoosuc, descending more than 5,000 ft, in a course of 30 m.; the Berlin falls on the Androscoggin; the Crystal Cascade and Glen Ellis on a tributary; Ripley's falls on a tributary of the Saco; the Silver Cascade on the side of Mt. Webster, and the Artist's falls in North Conway. The area of the entire White Mts. range is over 1200 sq.m. For descriptions, etc., see Drake's *Heart of the White Mountains*, 1882; Osgood's *New England*, a handbook for travelers; and various books of travel in New England. See Washington, Mount.

WHITE PINE (*P. Strobus*), called in England and sometimes in New England, Weymouth Pine, the tallest tree in the eastern United States, often attaining in primitive forests a height of 160 feet. See Pine.

WHITE PINE, a co. in e. Nevada, a part of the Great Basin, crossed by mountain ridges, bordering on Utah; 9892 sq. m.; pop. '90, 1721, chiefly of American birth, with colored. Silver from quartz rock is largely exported. Co. seat, Hamilton.

WHITE PLAINS, town and co. seat of Westchester co., N. Y.; on the New York Central and Hudson River railroad; 22 miles n.e. of the Grand Central depot, New York. It contains the new Bloomingdale asylum for the insane, new hall of records, Alexander institute (Pres.), Lyceum, institute, and co. law libraries, state and savings banks, hospital, and several weekly newspapers. Here in Oct., 1776, the battle of White Plains was fought. Oct. 12, Gen. Howe having occupied Throgg's Neck in Westchester co., Washington sent on a corps to White Plains, and began to evacuate Manhattan island. On the 23d, Washington took up his quarters at White Plains. On the 28th, Washington, with a large force, had a strong position, and Howe, not caring to attack him, dispatched some 4000 men to seize on Chatterton hill, w. of the Bronx river. The 1400 Americans, under McDougall, who occupied the hill, were forced to retreat to Washington's camp. While Howe was waiting for reinforcements, Washington, on the evening of the 31st, occupied the high ground above White Plains. Five days later Howe withdrew to Dobbs ferry. On Nov. 9 Washington began the removal of his troops to New Jersey. Pop. '90, 4508.

WHITE PRECIPITATE. See Mercury.

WHITE RIVER, a river of Arkansas and Missouri, rises in the Ozark mountains, flows n.e. into Missouri, then turning e. and s.e. into Arkansas, drains the northeastern portion of the state, and, flowing southerly, empties itself into the Mississippi near the mouth of the Arkansas. It is 800 m. long, and navigable 380 miles.

WHITE RIVER, formed by the junction of two forks in Knox co., Ind., flows in a generally s.w. direction, entering the Wabash about 25 m. below Vincennes, only 30 m. from the junction. The w. fork is nearly 300 m. long, and on it are situated Anderson, Muncie, and Indianapolis. The e. fork, sometimes called the Blue river, has a length of 250 miles.

WHITE RIVER, a tributary of the Missouri, rises in the extreme northwestern part of Nebraska, and after a northeasterly, and then easterly course through South Dakota, empties into the Missouri in Lyman county, in that state. It flows through the Bad Lands and has a total length of about 300 miles. Its largest affluent is the South Fork.

WHITE'S is a famous club (see Club), located on St. James St., London. It is an aristocratic club whose members are chosen without reference to politics, and its membership is limited to five hundred. When first established, in 1698, it was known as White's Chocolate House, but it was changed to a club about 1736. Frequent references may be found to this club in the writings of Swift, Pope, Macaulay, and many others. See Clubs.

WHITE SEA (Russ. *Bjeloje-nore*), an arm or great bay or inlet of the Arctic ocean, which, between cape Kanin on the Kaninskaia peninsula, and cape Sviatoi on the Kola

peninsula, penetrates the Russian government of Archangel southward to lat. 64° north. At its entrance between capes Kanin and Sviatoi it is 100 m. broad; after penetrating the land 150 m. in a south-easterly direction, it narrows to a width of 35 m.; but after sweeping s. for 200 m., it again considerably widens, forming in the n.w. the gulf of Kandalak, and in the s. and s.e. the great gulfs of Onega and Archangel or Dwina. The White sea covers an area estimated at 47,000 sq.m., and the length of its coast-line is over 1000 miles. The coasts in the n. and e. are mountainous, in other places they are mostly low, and abound in lakes, which communicate with the sea by rivers. The greatest depth of the White sea is 1133 feet. From the middle of August ice forms on the coasts sometimes to the width of 30 m., and is not melted till the following July.

WHITE SULPHUR SPRINGS, a watering-place in Greenbrier co., W. Virginia, 227 m. w. of Richmond. It has hotel accommodation for 1500 guests. The spring is in the lowest part of a beautiful valley, and is covered by a dome supported by 12 Ionic columns, and surmounted by a statue of Hygeia; it is 1925 ft. above tide-water; yields 30 gallons per minute of water at 62° Fahr., impregnated with sulphates of lime, soda, magnesia, carbonate of lime, chlorides of calcium and sodium, iron, iodine, sulphur, carbonic acid, sulphureted hydrogen, oxygen, nitrogen. It is considered efficacious in dyspepsia, liver diseases, gout, rheumatism, and diseases of the skin and kidneys. The various mineral springs, at a distance of 22 to 24 m. from the above, are also much resorted to.

WHITE SWELLING. See JOINTS.

WHITE VITRIOL. See ZINC.

WHITE-WASH, slaked quicklime, reduced to the consistency of milk by means of water. It is used for coloring walls, and as a disinfectant. If merely for coloring, a little size is added, but not when used for sanitary purposes.

WHITE-WOOD BARK. See CANELLA.

WHITEBAIT, a small fish, called by Valenciennes *rogenia alba*, and for which he constituted the genus *rogenia* as a distinct genus of the herring family (*clupeidæ*), but which is now generally regarded by naturalists as merely the fry of the herring. The whitebait fishery is actively prosecuted on some parts of the British coast, particularly in the estuary of the Thames, where the whitebait is very abundant in spring and summer, beginning to appear in the end of March or early in April. Adult whitebait are caught on the coasts of Kent and Essex during winter, and in this condition are about 6 in. in length. Whitebait is also found in the Forth. It is much in request as a delicacy for the table, forming a favorite dish of epicures. At the time when ordinarily captured, whitebait are only from an inch and a half to 4 in. in length. They are caught by means of bag nets sunk 4 or 5 ft. below the surface of the water. For several months they continue to ascend the river in shoals with the flood-tide, and descend with the ebb-tide, not being able to live in fresh water. They are fried with flour or crumbs; they are often laid on a napkin and sprinkled with fine flour and a little salt, rolled about till well covered with flour, and then thrown into a pot of boiling lard, where they remain till they are of a pale straw color. Londoners resort to Greenwich and Blackwall to enjoy whitebait dinners. It has become the practice for her majesty's ministers to repair to Greenwich for a whitebait dinner every year before the prorogation of parliament in autumn. Some of the corporations of London indulge in a similar annual festivity. The whitebait has the body more compressed than the mature herring; the belly is serrated; the lower jaw is longer than the upper; the scales are very soft, small, and thin, and very easily rubbed off; the color is silvery white, greenish on the back. The food of the whitebait seems to consist of minute crustaceans. It seems probable that the fry of all the British *clupeidæ*—the pilchard, the sprat, and the shad—are indiscriminately taken and used like the fry of the herring, under the name of whitebait.

WHITEBOY, the name of an illegal association of the peasantry in Ireland, which for a long series of years was the fruitful source of agrarian outrage, sometimes of a very revolting and sanguinary character. The association had its origin in the early years of the reign of George III.; and first took an organized form in the county of Tipperary, where it appeared in the shape of a united resistance to an attempt on the part of certain proprietors to inclose and appropriate lands up to that time common. The movement at the beginning was confined to throwing down the newly erected fences, and destroying the inclosure, from which circumstance the rioters were in the first instance called "levelers;" but their views soon extended further, and they addressed themselves to the redress, first, of the oppressive exactions of tithes, and afterward of various other grievances, especially those connected with the tenure of land. The name of whiteboys was given to them in consequence of their wearing white shirts in their nightly expeditions. Many acts of cruelty and outrage having been committed, a special commission was issued in 1762 for the trial of the offenders; but the repression was only partial and temporary, and whiteboyism re-appeared more than once in the southern province. In 1787 a new association, whose members called themselves the "Right-boys," appeared in the same district, and was made the subject of discussion in the Irish parliament. The conflicts of the northern orangemen (q.v.) and ribbonmen (see RIBBONISM) for a time drew attention away from the minor discontents of the south; but the same spirit of secret

combination has continued among the peasantry down to the present day. The shana vests, caravats, Rockites, terry alts, and other more obscure or more local denominations, must be regarded as embodiments of the very same discontent, which has long held its ground among the poorer classes in Ireland, and which, although undoubtedly exaggerated and imbittered by the recollections of hereditary wrong inseparable from the condition of a conquered people, are held, even by politicians of moderate views, to have much justification in the social condition of the people, and in certain striking anomalies of the legislature in reference to Ireland. The ground of discontent furnished by the endowment and establishment of the church of a small minority of the population, has now ceased to exist. See FENIAN SOCIETY.

WHITEFIELD, GEORGE, one of the founders of Methodism, was b. in the Bull inn, at Gloucester, on Dec. 16, 1714. He was educated at the grammar-school of his native town, at which he appears to have distinguished himself, especially by elocutionary displays at the annual visitations. On leaving school, he was for a time engaged assisting in the business of his mother, the hostess of the Bull inn; but he obtained admission as a servitor at Pembroke college, Oxford, when in his 18th year. About three years earlier, John and Charles Wesley had laid, in the university of Oxford, the foundations of Methodism—a system which at first resembled the rule of a religious order more than the bond of a religious sect; requiring from its professors ascetic observances and devotion to works of piety and charity. It was not till he had been upward of a year at the university that Whitefield became associated with the Methodists. He at once made himself remarkable among them for zeal, for the austerity of his ascetism, for labor too great for his strength among the sick and the prisoners in the jail. His health gave way, and he had to go home, when his native air soon restored him; after which he carried on at Gloucester the same pious and self-denying practices which he had begun at the university. His conduct drew upon him the attention of the bishop of the diocese, who offered, though Whitefield was only twenty-one, to admit him immediately into orders. The offer was accepted, and Whitefield was ordained a deacon in 1736, before he had taken his degree. He preached his first sermon in Gloucester cathedral, and the effect of it was remarkable. The vehemence and earnestness of his oratory deeply moved the audience; and five persons are said to have been driven mad with fear and excitement. Complaints were made to the bishop; but this good man gave no heed to them—simply saying that he hoped the madness would last to the following Sunday. During the next two years, Whitefield preached with similar results in various churches in England.

Meanwhile, Wesley had been in America establishing missions among the colonists; and in 1738 he desired Whitefield to join him, a request that was immediately complied with. Whitefield had to go to London to make arrangements for his journey; and this visit, though not his first, seems first to have made him known to the inhabitants of the metropolis, upon all classes of whom—fine gentlemen like Chesterfield, and cool skeptics like Bolingbroke, as well as the more mobile crowd—he afterward made an impression such as, probably, no other preacher ever produced. His success in London was immediate, and much exceeded all that had befallen him previously. The doors of the church in which he was to preach were besieged before the dawn; the unlighted streets in the early morning were filled with persons carrying lanterns, making their way to the place of worship many hours before the time of service. This lasted until his departure for America. He was hereafter to be almost as closely connected with evangelical labors in America as in England itself; but on this first occasion, his stay was short—only a few months. He returned to be admitted to priest's orders, and to collect funds for the establishment of an orphanage in Georgia. He soon went back to America, but not before a beginning had been made of his split with the English church, whose clergy he offended by preaching in the open air, whether he got permission from the parish clergyman or not, and by deviating, whenever he thought fit, from the liturgy of the church. But the remarkable and beneficial effects of his preaching on the rude miners and others who flocked to hear him, consoled him for clerical censures; and after this, he seems to have preached almost by preference in the open air. His second visit to America occupied nearly two years. He came back in 1741.

It was about this time that doctrinal differences led to his separation from John Wesley—both of them being by this time disowned by the established church. Wesley believed and preached the doctrine of universal redemption; Whitefield was a rigid Calvinist. Each thought his belief of the utmost importance, and, in the end, each excommunicated the other. Whitefield's supporters now built him a large shed at Moorfields, near Wesley's chapel—which, being temporary, was known as the tabernacle; and his preaching gathered immense audiences around him. But he had no talent for organization; and as soon as he went away on his frequent and protracted journeys, his supporters began to disperse. But that the countess of Huntingdon, a lady of wealth and of abilities, became a convert to his views, Whitefield, in all probability, would not have founded a sect. But this lady appointed him her chaplain; she built and endowed chapels to maintain his Calvinistic doctrines; and thus a slight memorial of Whitefield's preaching, though it more directly commemorated the zeal and energy of lady Huntingdon, remains in what is known as the Huntingdon connection.

One of his most famous missionary journeys was that which he made to Scotland in 1741. He went to Scotland on the invitation of Ralph and Ebenezer Erskine, well known as leaders of a secession from the church of Scotland; but his notions were too catholic for his friends; he was as ready to preach in a parish church as to a seceding congregation, and more ready still to preach in the open air; and the Erskines soon differed from and separated from him. That the impression he made upon the people of Scotland was very strong and very general, may be inferred from the fact that the leading corporations of Scotland—Edinburgh, Glasgow, Aberdeen, Stirling—admitted him to their citizenship. At Cambuslang, in Lanarkshire—a mining district, mainly inhabited by rude colliers, then *adscripti glebæ*—his preaching produced one of the most remarkable "revivals" of modern times; many thousands were stricken with concern about their souls, and violent physical manifestations followed upon their excitement—foaming at the mouth, bleeding at the nose, convulsions—which, by many who read of them, were attributed to divine influence, by others to the devil. It was on his return from this visit to Scotland, that Whitefield, making a stay in Wales, met and married a widow, a Mrs. James. His marriage, like that of Wesley, was not a happy one.

To America, Whitefield paid seven visits, several of which lasted for two or three years. He set out for America for the last time in 1769. He was ailing at the beginning of the voyage; he was ill at the end of it; and he died somewhat suddenly not long after his arrival in America, at Newburyport, Mass., on Sept. 30, 1770. A collection of his sermons, letters, and controversial writings was published in the following year (*The Works of the Rev. George Whitefield*, 6 vols. Lond., 1771); and in 1772 were published his memoirs, by Dr. Gillies. His writings do not sustain the impression which would be derived from the accounts of his preaching. They show him as a man of somewhat slender talent and common-place quality of mind; quite unlearned; entirely free from the casuistical turn, as well as deficient in the worldly knowledge and prudence, for which Wesley, like many other enthusiasts, was pre-eminent. His success as a preacher seems to have been in no small degree due to a sonorous but expressive voice; no doubt it was mainly due to the earnestness of his faith, to the fluency and rude strength of his homely language, and to that vehemence and impetuosity of nature which, perhaps, is the thing most distinctive of the orator. Of the *Memoirs of the Life and Character of George Whitefield*, by J. Gillies, D.D., of the College church, Glasgow, originally published at London in 1772, subsequent editions, containing additional matter, appeared in 1798, in 1811, 1812, 1813, and in 1827. An anonymous *Life of George Whitefield*, founded upon his journals and letters, and borrowing largely from the work of Dr. Gillies, appeared at Edinburgh in 1826. *Whitefield's Life and Times*, by Robert Philip, D.D., was published at London in 1837; and there has since appeared *George Whitefield: a Light rising in Obscurity*, by Andrews (Lond. 1864); and, in 1876, another full memoir by Tyerman.

WHITEFISH, *Coregonus albus*, a fish of the family *salmonidæ* (q.v.), of the same genus with the gwyniad, vendace, powan, pollan, etc. It is found in the lakes and large rivers of North America, from the St. Lawrence and its tributaries to the Arctic regions, and is one of the most valuable of American fresh-water fishes, abounding over a great extent of country, and being excellent for the table. It is the *attihawmeg* of the north-western Indians. The body is elongated but thick, the head small and the muzzle pointed, the tail forked, the scales large. The mouth is destitute of teeth. It sometimes attains a length of two feet and a half, and weighs ten pounds. It is bluish-gray on the back, lighter on the sides, and white below. It spawns in October, proceeding from the lakes up the rivers for this purpose. It usually swims in shoals, like its small British congeners. It feeds chiefly on insects and entomostraca. It is caught by nets, which are often spread under the ice, and the fishery is attended with much labor and exposure. The Indians sometimes spear it through holes in the ice. The whitefish forms the principal food of many Indian tribes and of the fur-traders during great part of the year. It is often salted by them. The flesh is bluish-white, changing to a pure white when boiled, whence the name. The most southern lake in which the whitefish is found is lake Champlain. An allied species, the Otsego Whitefish (*C. Otsego*), found in lake Otsego, is also of exquisite flavor; but it is now rare.

WHITEHALL, a town and city in Greene co., Ill.; on the Burlington route and the Chicago and Alton railroads; 34 m. s.w. of Jacksonville. They are in an agricultural, coal mining, and potter's clay region, and the city has manufactories of pottery, drain-tile, and sewer-pipe. Pop. '90, town, 3244; city, 1961.

WHITEHALL, a town and village in Washington co., N. Y.; at the head of lake Champlain, and on Poultney river, the Champlain canal, and the Delaware and Hudson railroad; 24 m. w. by s. of Rutland, Vt. The village was settled by Philip Skene in 1761, was long known as Skenesborough, and was an important military depot in 1812. There are national banks, electric lights, high school, union school library, weekly newspapers, shipyards, railroad shops, and silk, hosiery, grist, and saw mills. Pop. '90, town, 5402; village, 4434.

WHITEHA'VEN, a parliamentary borough and seaport of Cumberland, near the point where the estuary of the Solway firth joins the Irish sea, 40 m. s.w. of Carlisle by railway, 36 in a straight line, and 34 m. e.n.e. of Ayre point, the northern promontory of

the isle of Man. The harbor is commodious. The sources of the prosperity of the town are its vicinity to extensive collieries, and there are iron and brass foundries and blast furnaces, iron smelting works, and manufactures of cordage, sail-cloth, etc. Coal is exported in large quantities. Pop. '81, 19,295; '91, 18,044.

WHITEHEAD, Cortland, D.D., b. New York, 1842 ; graduated at Yale coll., 1867 ; was ordained priest in the Prot. Epis. church, 1868 ; was a missionary in Col. for three years ; and rector of the Church of the Nativity, South Bethlehem, Penn. He was consecrated bp. of Pittsburgh, 1882.

WHITEHOUSE, Frederick Cope, Egyptologist. He graduated at Columbia College, 1861, and at Gen. Theol. Sem., 1865, but was not ordained. He has made special explorations and surveys in Egypt, and pub. several papers and pamphlets of value, *Lake Moeris : from recent explorations*, 1882 ; *Researches in the Moeris Basin*, 1883 ; *Moeris the wonder of the world*, 1885 ; *The Pyramid-Hill of Gizelo*, 1885 ; also, *Is Fingal's cave artificial ?* 1882 ; and *The Science-Myth of Fingal's cave*, 1884.

WHITEHOUSE, Henry John, D.D., D.C.L. ; 1803–74 ; b. New York ; graduated, Columbia college, 1821, and at the General Episcopal Seminary, New York, 1824 ; rector of St. Luke's, Rochester, 1830–44 ; St. Thomas's, New York, 1844–51 ; consecrated assistant bishop of Illinois, 1851, and bishop, 1852.

WHITELOCKE, Bulstrode, 1605–75 ; b. London ; educated at Oxford, but took no degree; read law in the Temple, and in 1626 was among the junior counsel at the impeachment of Buckingham. In 1640 he was elected to the "long" parliament, and, as chairman of the impeachment committee, drew up the charges against the earl of Stafford. He was also one of the Oxford commissioners appointed to treat with Charles I.; a member of the Westminster assembly, 1643; governor of Windsor, 1644; commissioner of the great seal, 1649. He disapproved of the trial of the king, and refused to take part in it. In 1656 he was speaker of the house of commons; was one of Cromwell's lords, and commissioner of the great seal to Richard. He left the MSS. of an autobiography and other works, the most noteworthy of which was a historical account of the important events in which he participated.

WHITESIDE, a co. in n.w. Illinois, having the Mississippi river for its n.w. boundary ; drained by Rock river, Elkhorn, and Little Rock creeks ; 700 sq.m. ; pop. '90, 30,854. Co. seat, Morrison.

WHITETHROAT, *Curruca cinerea*, a bird of the family *sylviadæ*, a summer visitant of Britain: plentiful during summer in the greater part of England and in Ireland, but comparatively rare in Scotland. It is also common during summer in the s. and middle of Europe, and is found even in the north. It places its nest in a low bush, or among a tangled mass of brambles and weeds. Its food consists both of insects and berries Its song is not very sweet, but is delivered with great energy, and it seems to vie with other birds in singing, refusing to be outdone. It is very lively and amusing as a cage-bird, and very easily tamed. The whole length of the whitethroat is 5½ inches. Its plumage is brown, of various shades; the breast and belly brownish-white, tinged with rose-color in the male.

WHITEWATER, a city in Walworth co., Wis.; on the Chicago, Milwaukee and St. Paul railroad; 45 m. s.e. of Madison. It is the seat of a state normal school, and has a public library, normal school library, national bank, weekly newspapers, and manufactories of cheese, flour, beer, and lumber. Pop. '90, 4359.

WHITEFIELD, a co. in n. Georgia, having the Connasauga river for its e. boundary; 285 sq.m. ; pop. '90, 12,916. Co. seat, Dalton.

WHITFIELD, Henry, 1597–about 1651 ; b. England ; called to the bar, but afterward took orders in the church of England. He protected some of the Puritan divines during Laud's persecution, to which he was himself finally exposed. He emigrated to New Haven in 1637, and was one of the founders of Guilford. He afterward returned to England, and was minister at Winchester. He wrote on the progress of religion among the Indians, and other subjects.

WHITGIFT, John, the third Protestant archbishop of Canterbury, was b. at Great Grimsby, in Lincolnshire, according to one account in 1530, according to another in 1533. His father was a merchant, and is said to have belonged to a family long established in Yorkshire. His early years were passed within the abbey of Wellow, near Grimsby, of which his uncle was the abbot; and from that he went to St. Antony's school in London, a religious house then in great reputation. About 1548 he was entered at Queen's college, Cambridge. After a short time he removed to Pembroke hall, of which he continued a member till 1555, when he was elected a fellow of Peterhouse. He took orders in 1560, and as he showed a remarkable talent for preaching, the bishop of Ely appointed him his chaplain, and gave him the living of Feversham. In 1563 he was appointed lady Margaret's professor of divinity. In 1567 he became master of Pembroke hall; and in the course of the same year queen Elizabeth, who admired his preaching, and had made him one of her chaplains, appointed him to the mastership of Trinity college. About this time he also obtained the regius professorship of divinity, and took his doctor's degree. He was appointed dean of Lincoln in 1571, bishop of Worcester in 1577, and archbishop of Canterbury in 1583. He at one time held together

—under a dispensation from the archbishop—the deanery of Lincoln, the mastership of Trinity, the regius professorship of divinity, and the living of Feversham: and the dispensation enabled him to hold, along with these, any other benefice whatever. This cannot have been often paralleled, even in the history of pluralities. Of course the man so favored had rendered and was rendering considerable services to the church and to the crown.

His first work, on becoming master of Trinity, was upon a revisal of the statutes of the university. He obtained such powers for the heads of houses as enabled them to eject from the lady Margaret's professorship the able and energetic Puritan, Cartwright, on the score of his Calvinistic creed. He afterward, at the request of Archbishop Parker, published an answer to an "Admonition of Parliament" (drawn up by a clergyman named Field), presented to the house of commons on behalf of the Puritans, in which it was maintained that, in matters of doctrine and discipline, the church should admit nothing as authoritative but what was contained in the word of God. This work was published in 1572. It has always been held that in it Whitgift vindicated the position of the Anglican church against the Puritans with no less ability than bishop Jewell showed in defending it against the Romanists. He was answered by Cartwright on behalf of the Puritans; he replied, and Cartwright rejoined; and as the works on either side were revised by the most learned and eminent men of the two parties, they give an excellent view of the state of opinions in the Anglican church at this time. After becoming primate, Whitgift labored assiduously to secure uniformity of discipline in the church. He had the full confidence of queen Elizabeth, who placed all the church patronage of the crown, including the bishoprics, in his disposal, and he was armed with full powers for carrying out his design. He required the clergy not only to subscribe to the royal supremacy, the liturgy, and the thirty-nine articles of the church, but also to a set of additional articles framed mainly with the view of purging the church of Puritanism. The bishops were required to administer those tests; and the clergymen who refused to accept them were deprived of their livings. This measure was harshly conceived; but Whitgift is said to have been a kindly man, and to have used his authority over the clergy gently, especially in his later years. He was made a privy councilor in 1586, and in that capacity drew up a set of statutes for cathedral churches, to make their services conform to the principles of the reformation. He was offered the chancellorship by queen Elizabeth, but he declined the office. On the accession of king James, he seems to have been much alarmed for the stability of the system which he had spent his life in rearing; and though the monarch treated him with the utmost observance, anxiety upon this account is said to have hastened his end. He died of paralysis Feb. 29, 1604. He is undoubtedly entitled to rank with the ablest and most distinguished prelates that have adorned the English church. He founded a magnificent hospital and a grammar-school at Croydon.

WHITING, *Merlangus*, a genus of fishes of the family *gadidæ*, differing from the cod, haddock, and their congeners (*gadus* or *morrhua*), in having no barbule on the lower jaw, and also in their more slender form, which adapts them for pursuing their prey more actively and further from the bottom of the sea. The Common Whiting (*M. vulgaris*) is abundant on many parts of the British coast, particularly on the western coasts of Britain, and on the coasts of Ireland; on the northern coasts of Scotland it is comparatively rare. It not unfrequently attains a weight of 3 or 4 lbs.—although the whitings brought to market are seldom of this size; but a whiting has been taken of 7 lbs. weight. The head and body are compressed; the deepest part is at the vent, which is opposite the middle of the first dorsal fin; the upper jaw extends a little beyond the lower; both jaws have long sharp teeth, and there is a triangular patch of teeth on the palate. The scales are small. There are three dorsal fins, and two anal fins; the tail-fin is even. The color is dusky yellow on the back, the sides paler, the belly silver white; there is a black spot on the upper part of the root of the pectoral fin. The whiting is a voracious fish, preying on mollusks, worms, crustaceans, and small fishes. It is caught chiefly by hand lines and long lines; mussels and pieces of cuttle-fish are very generally used for bait. It is in high esteem for the table, and is regarded as particularly delicate and easy of digestion. The flesh is of a pearly whiteness, whence the English name.

WHITING is an impure carbonate of lime, prepared by grinding and then washing chalk, so as to separate the coarser particles from the finer ones, which are collected in masses, and dried. It is extensively used for size-painting, and as an article of household economy, for cleaning plate; and on emergency, may be employed as an antidote (in suspension in milk) in cases of poisoning with oxalic, or one of the mineral acids.

WHITING, a town in Lake co., Ind., on lake Michigan, and the Pennsylvania Co.'s railroads; 17 m. s.e. of Chicago. It has a good harbor and steamer communication with the ports of the great lakes, and is principally engaged in the manufacture of paint and in refining and shipping petroleum oil. Pop. '90, 1408.

WHITING, William, 1813–73; b. Mass.; graduated at Harvard college and the Harvard law school; began the practice of his profession at Boston, and gained a high rank. He was solicitor of the U. S. war department, 1862–65, and had considerable influence on some of Lincoln's measures. He was a member of congress at the time of his death. His most important publication is his work on *The War Powers of the President, and the Legislative Powers of Congress in Relation to Rebellion, Treason, and Slavery*

WHITLEY, a co. in n.e. Indiana; drained by the Eel river; 330 sq.m.; pop. '90, 17,768. Co. seat, Columbia City.

WHITLEY, a co. in s.e. Kentucky, drained by the Cumberland and Laurel rivers; containing the cataract of the Cumberland river, with a perpendicular fall of 60 ft.; 580 sq.m.; pop. '90, 17,590, chiefly of American birth, with colored. Co. seat, Williamsburg.

WHITLOW, or PARONYCHIA, is a painful inflammatory affection of the phalanges of the fingers, almost always proceeding to suppuration. There are several varieties of this affection, according to the texture primarily attacked; thus, it may be situated in the skin, the cellular (or connective) tissue beneath the skin or under the nail, the tendons or tendinous sheaths running along the fingers, or the periosteum. If the skin be the seat of inflammation, vesicles appear, which soon discharge pus, after which relief is rapidly afforded. Such cases require little care or attention, and give rise to hardly any constitutional disturbance. If the cellular tissue is the primary seat of inflammation, there is a painful sensation of tenseness and throbbing of the part, and often considerable febrile disturbance, until the pus can be evacuated. Although this form is painful, no serious mischief is to be apprehended. When, however, the tendons and their sheaths, or the periosteum, are affected, a much more serious form of whitlow is developed, which has been already discussed in the article TENDON. In this form, the suppuration may extend up the arm, and occasion destruction of the joints, and even death.

Whitlow may originate either spontaneously, or after an external injury, such as a prick from a needle, thorn, etc. In the treatment of the milder forms, the finger or thumb should be held for half an hour or longer in water as hot as can be borne, after which lunar caustic should be rubbed freely over the painful surface; and if there are any febrile symptoms, the patient may take a powder, consisting of 4 grains of calomel, 3 of James's powder, and 3 of Dover's powder, at bed-time, to be followed in the morning by an ordinary black draught. The hot local baths should be carried on till matter shows itself; and, as soon as its presence and seat are determined with certainty, an incision should be made to admit of its escape. Even if suppuration has not taken place, a free incision into the inflamed part often gives great relief. There is a pernicious popular idea that the application of cobblers' wax, or some other stimulating substance, will draw the inflammation to the surface, and bring the whitlow "to a head." There is reason to fear that a considerable number of fingers are annually sacrificed to this delusion. As it is not always easy to state in an early stage how a whitlow may turn out, it is advisable that surgical aid should always be at once obtained.

WHITMAN, a co. situated in s.e. Washington, having the Snake river for its s. boundary; about 2,124 sq.m.; pop., '90, 19,109, chiefly of American birth, with colored. Co. seat, Colfax.

WHITMAN, MARCUS, D.D., American missionary and patriot, born in N. Y. in 1802; went in 1835 as missionary to Oregon Territory, commissioned by the A. B. C. F. M.; discovered a plot to annex that region to the British possessions, and in the winter of 1842–43 made a horseback journey across the continent to warn and advise the U. S. government; returned in 1843 with a large emigrant train; was highly successful in missionary work among the Indians, but was treacherously murdered, with his wife, in 1847. Whitman county and Whitman college, both in Washington, were named for him. See Barrows, *Oregon*, and article OREGON.

WHITMAN, SARAH HELEN (POWER), 1803–78; b. R. I. In 1828 she married John W. Whitman of Boston. She was a literary critic and poet of some merit. *Hours of Life and Other Poems*, a collection of minor pieces, was published in 1853, and *Edgar Poe and his Critics* in 1860.

WHITMAN, WALT, b. West Hills, L. I., 1819; educated in the Brooklyn and New York public schools. He worked at the printer's trade in summer, and was a schoolteacher in winter. He traveled extensively in this country and Canada, 1847–48; was an editor for a short period in New Orleans and Long Island, and finally returning to Brooklyn, learned the carpenter's trade. He was a nurse in the federal military hospitals, 1862–65; and a government clerk at Washington, 1865–74. He long resided in Camden, N. J. He published *Leaves of Grass*, a book of poems without rhyme. His other works include *Democratic Vistas; The Two Rivulets; Drum Taps; Specimen Days and Collect* (1883); *Good-By, My Fancy* (1891). His *Complete Works*, including letters to his family during the war, and *Letters to Peter Doyle*, were published in 1887. There is much debate regarding his rank as a poet—some critics placing him among the most eminent poets; others denying him even the name of poet. He has many admirers in England. His style is so undeniably his own that he can be classed with no other writers. He died in 1892.

WHITNEY, ADELINE D. (TRAIN), b. Boston, 1824; married Seth D. Whitney of Milton, Mass. Her first published writing was a poem, *Footsteps on the Seas* (1857). She has contributed to several magazines, and is the author of the very popular stories, *Faith Gartney's Girlhood* (1863); *A Summer in Leslie Goldthwaite's Life* (1866); *Patience Strong's Outings* (1868); *Real Folks; Bonnyborough* (1885); *A Golden Gossip* (1892); and others.

WHITNEY, ASA, 1791–1874; b. Mass.; in his youth learned the blacksmith's trade, and became a machinist. He was engaged in the manufacture of machinery in several

states; in 1830 was made master-machinist, and in 1833 superintendent of the Mohawk and Hudson railroad. From 1839 to 1841 he was a canal commissioner of New York, and in 1842 went into partnership with Matthew Baldwin in the manufacture of locomotives at Philadelphia, where he remained until his death. In 1848 he began the manufacture of patent iron annealed car-wheels, by which he acquired large wealth. He left $50,000 to the university of Pennsylvania for the founding of a chair of dynamical engineering.

WHITNEY, Eli, American inventor, was b. at Westborough, Mass., Dec. 8, 1765, and was educated at Yale college, where he paid his expenses partly by school teaching, partly by mechanical labor. Having graduated in 1792, he went to Georgia as a teacher; but finding a generous patron in the widow of Gen. Greene, of the revolutionary army, he resided on her estate, and studied law. The cotton culture at this period, especially that of the best kind, the "green seed," was limited by the slow and difficult work of separating the cotton from the seed by hand; but Mrs. Greene told her complaining neighbors that she was sure Whitney could help them out of their trouble, for he could make anything. At their desire, he set to work under great disadvantages, for he had to make his own tools, and even draw his own wire; but the reports of his success prompted some lawless people to break into his workshop, and steal his machine, and get others made before he could secure a patent. He, however, formed a partnership with one Miller in 1793, and went to Connecticut to manufacture cotton gins; but the lawsuits in defense of his rights took all his profits, and $50,000 voted him by the state of South Carolina. Finally in 1798 he got a government contract for the manufacture of fire-arms, and was the first to effect the division of labor, by which each part was made separately. He made a fortune by this manufacture, carried out with ingenious machinery at Whitneyville, Conn.; while he had but barren honor from the gin, one of the most important of the whole series of inventions connected with the cotton manufacture. He died at New Haven, Jan. 8, 1825. See Cotton.

WHITNEY, Josiah Dwight, b. Mass., 1819; graduated at Yale college in 1839. The next year he was employed on the New Hampshire geological survey. He spent the years 1842–46 in European study, and soon after his return engaged on a survey of the lake Superior mineral region. From 1855 to 1860 he made a geological survey of Iowa, and the lead district in Wisconsin; and in 1860 he became state geologist of California. In 1865 he became Sturgis-Hooper professor of geology at Harvard university. He has published valuable reports of his surveys and other works. D. 1896.

WHITNEY, William Collins, b. Conway, Mass., 1841; graduated at Yale coll., 1863; afterward at the Harvard law school. He began the practice of law in New York, in the office of Judge Lawrence, and entered political life in the campaign against the Tweed ring, 1870–71. In 1875 he was appointed corporation counsel by Mayor Wickham. He aided in organizing the county democracy in New York, and was a strong opponent of Tammany. In 1885 Pres. Cleveland appointed him sec. of the Navy.

WHITNEY, William Dwight, ll.d., b. Mass., 1827; graduated in 1845 at Williams college. He afterward studied in Berlin and Tübingen, and is now the foremost of American philologists and grammarians. In 1853 he returned to this country, and in 1854 was made professor of Sanskrit in Yale college. In 1856 he published, with Prof. Roth of Berlin, the *Atharva Veda Sanhitâ;* in 1862 a phonetic grammar on the *Atharva Veda,* with text, notes, and translation; in 1868 twelve lectures on the principles of linguistic science; and in 1869 a German grammar and reader, in common use in the schools and colleges of the country. He also contributed many articles to the *Bibliotheca Sacra, New Englander, Journal of the Oriental Society,* and other periodicals; and furnished articles on oriental philology and kindred topics to Appleton's American Cyclopædia. In 1879 Prof. Whitney published a Sanskrit grammar of both the classical language and the older dialects. He is the author of *Language and the Study of Language,* etc. He died in 1894.

WHITON, James Morris, ph.d., b. Boston, 1833; graduated Yale college, 1853; teacher in high school, Worcester, Mass., 1853–54; rector Hopkins grammar school, New Haven, Conn., 1854–64; pastor First Congregational church, Lynn, Mass., 1865–69; pastor of North Congregational church, Lynn, 1869–75; principal of Williston seminary, Easthampton, Mass., 1876–78; pastor of First Congregational church, Newark, N. J., 1879–85; and (1886) of Trinity Congregational church, New York. He has published: *Latin and Greek Lessons and Primers,* 5 vols.; *Select Orations of Lysias; Is Eternal Punishment Endless?; Essay on the Gospel according to Matthew; The Gospel of the Resurrection; The Law of Love; Old Points to New Texts.*

WHITSUNTIDE ("White-Sunday-tide"), the English name of the season of Pentecost (q.v.), is so called from the white garments anciently worn by the newly baptized catechumens, to whom that sacrament was usually administered on the vigil of Pentecost. The name "Whitsuntide" comprehends the entire octave or the week which follows Pentecost Sunday; but the word is more strictly applied to the Sunday, Monday, and Tuesday of that week. The two latter days, down to a very recent date, were observed in the Roman Catholic church as holidays of strict obligation. Many festive observances were anciently practiced in connection with the Whitsuntide holidays, which in England and other Protestant countries still subsist, having outlived the religious association.

WHITTEMORE, Amos, 1759–1828; b. Mass.; at first a gunsmith in Cambridge; afterward engaged in the manufacture of wool and cotton cards. In 1797 he secured a

patent for a card-making machine to puncture the leather and set the wires, which was sold for $150,000, but eventually bought back by his brother Samuel. Whittemore was never able to secure an English patent for his invention.

WHITTEMORE, THOMAS, D.D., 1800–61; b. Boston; studied theology with the rev. Hosea Ballou; minister of a Universalist church at Milford, Mass., 1821, and at Cambridgeport, 1822–31; was associate editor of the *Universalist Magazine;* editor and proprieter of *The Trumpet,* a Universalist paper, for 30 years. He was president of the Massachusetts and Vermont railroad, president of the Cambridge bank, and member of the legislature. He published: *Modern History of Universalism; Songs of Zion; Life of Hosea Ballou; A Plain Guide to Universalism.*

WHITTIER, JOHN GREENLEAF, American author and poet, was born near Haverhill, Mass., Dec. 17, 1807, and was descended from an emigrant to New England in 1638, whose children became members of the society of Friends. His life before his majority was attained was that of the average country lad in New England, and was spent mainly in work on his father's farm. Among the few books that found their way into the simply furnished farm-house was a copy of Burns, and this incited young Whittier, who had already begun to put his thoughts into rhyme, to imitate the Scottish poet, and some lines contributed in his nineteenth year to the *Newburyport Herald,* at that time edited by William Lloyd Garrison, possessed sufficient merit to draw from the latter encouraging words, and to lead to a personal acquaintance. Owing largely, no doubt, to Garrison's counsel, young Whittier determined to obtain a better education, and having learned shoemaking, a common industry in that section of the country, he earned enough to warrant his entering Haverhill Academy, where he studied for a year or more, 1827–28, and gained additional experience by teaching school one winter at Amesbury. His advance was so rapid that in 1829 he became editor of the *American Manufacturer,* published in Boston, and in 1830 was called to Hartford, Conn., to edit the *Haverhill Gazette,* succeeding George D. Prentice, who had gone to Kentucky to write the life of Henry Clay. Shortly after this he edited the *New England Weekly Review.* In 1831 Garrison started his anti-slavery paper, *The Liberator,* and Whittier, who came to his aid and published in that paper some of his most passionate protests against slavery, deliberately imperilled his own chances for popularity—for the sake of principle. In 1832 his health failed and he returned to Haverhill, where he carried on the ancestral farm, and represented the town in the state legislature, 1835–36. By this time his name had become a household word in anti-slavery families throughout the country, and in 1836 he was appointed Secretary of the American Anti-Slavery Society. In 1838 he took up his residence in Philadelphia, and for a year edited the *Pennsylvania Freeman,* but even in the stronghold of Quakerism, there was objection to free speech, though the editor's foes were not of his own household of faith, and the obnoxious paper was suppressed by a mob that sacked and burned the printing-office. Whittier then returned to Massachusetts, and after editing at Lowell for six months, the *Middlesex Standard,* made Amesbury his home, though from 1876 much of his time was spent at Oak Knoll, Danvers. From 1847 to 1859 he contributed editorials to the *National Era,* the anti-slavery paper published in Washington, for which Mrs. Stowe wrote *Uncle Tom's Cabin.* He was a member of the Massachusetts Electoral College in 1860 and 1864, but after that time took little if any part in public life, though continuing to guide or excite public sentiment through his writings. In 1877 his seventieth birthday was celebrated by a dinner given in Boston, and the venerable poet received appreciation and loving tributes in prose and verse from the most distinguished authors of America.

Whittier's prose writings are a *Life of John G. C. Brainard* (Hartford, 1831); *Legends of New England* (Hartford, 1831); *Justice and Expediency, or Slavery considered with a view to its Abolition* (1833); *The Stranger in Lowell* (1845); *Supernaturalism in New England* (N. Y., 1847); *Leaves from Margaret Smith's Journal* (1849); *Old Portraits and Modern Sketches* (Boston, 1850); *Literary Recreations and Miscellanies* (1854); *Prose Works* (2 vols., 1866). He aided in founding the *Atlantic Monthly* in 1857, a journal whose sympathies with the anti-slavery movement were constant and pronounced. His poetical works comprise *Moll Pitcher* (1832); *Mogg Megone* (1836), subjects already treated in *Legends of New England; Ballads* (1838); *Lays of My Home, and other Poems* (1843); *Miscellaneous Poems* (1844); *The Voices of Freedom* (Phila., 1849); *Songs of Labor, and other Poems* (Boston, 1853); *The Chapel of the Hermits, and other Poems* (1853); *A Sabbath Scene: A Sketch of Slavery in Verse* (1853); *The Panorama, and other Poems* (1856); *Complete Poetical Works* (2 vols., 1857); *Home Ballads, and other Poems* (1860); *Snow-Bound* (1862); *In War Time, and other Poems* (1863); *National Lyrics* (1865); *The Tent on the Beach, and other Poems* (1867); *Among the Hills, and other Poems* (1868); *Miriam, and other Poems* (1870); *The Pennsylvania Pilgrim, and other Poems* (1872); *Mabel Martin* (1875); *Hazel Blossoms* (1874), including poems by his sister, Elizabeth Hussey (1815–64); *Poetical Works* (new ed., 1875); *A Centennial Hymn* (1876); *The Vision of Echard, and other Poems* (1878); *The King's Missive, and other Poems* (1881); *The Bay of Seven Islands, and other Poems* (1883); *Poems of Nature* (1885); *St. Gregory's Guest, and other Poems* (1886); *Legends and Lyrics, Poems* (1888). He compiled, with the aid of Lucy Larcom, *Child Life; Child Life in Prose* and *Songs of Three Centuries,* and edited the *Journey of John Woolman,* the Quaker preacher and philanthropist (1871). Whittier's *Complete Poetical and Prose Works* (7 vols.) were published in 1888–89.

If it is true, as is usually claimed, that Longfellow is our most popular poet, Whittier must be ranked next to him, and indeed in certain characteristics he is his equal. The finish and faultless melody that distinguish everything from the pen of the author of *Evangeline*, merits largely due to Longfellow's artistic temperament and culture, are often lacking in the verses of the Quaker bard, but Whittier is fully as direct, as genuine in his sentiment, as truthful in his word paintings, and is far more sympathetic, where the masses are concerned. If his sonnets and ballads are rugged and unfinished at times, they are like the fields he ploughed and mowed in his boyhood, unattractive to one who surveyed them from afar, but yielding wholesome odors of upturned earth and clover, and affording around the boulders that strewed them graceful ferns and rare wild flowers. Pre-eminently is Whittier the poet of New England, whether he recites with trembling voice the trials of Quaker and of witch-haunted Puritan, the legends of the coast towns or of the Indian ravaged settlements; and when he sings of farm life, and of families gathered about their firesides, it is with a love that can only be born of experience. *Snow-Bound*, one of his few continued poems, perhaps the most typical one, is a charming idyl, which is largely autobiographical, and its descriptions of winter scenery are as faithful as any that Lowell or Thoreau have written. It is rightly ranked by Stedman with "The Deserted Village" and "The Cotter's Saturday Night," and Burroughs has pronounced it "the most faithful picture of our northern winter that has yet been put into poetry." Whittier's sentiment is ever healthful and almost naïve in its simplicity, and "The Friend's Burial" and "My Lost Playmate" may be mentioned as instances. The influence of his pen before and during the civil war must be seriously considered by one who seeks to account for the ardor with which the New England States entered into and endured that conflict, but his sympathies were not bounded by geographical lines, for social wrongs, and religious bigotry in all nations found in him a stern rebuker. His religious poems evince a firm faith in a pitying All-Father, a happy resignation, and a loving hope for men of every creed. Some of his religious poems are very beautiful, and one, at least, "We may not climb the Heavenly steeps," is found enriching the hymn-books of many denominations. He died Sept. 7, 1892. See the admirable criticism of Whittier as an author in Stedman's *Poets of America* (Boston, 1885); *John Greenleaf Whittier, his Life, Genius and Writings*, by William Sloane Kennedy (1882), and the biographies by Underwood (Boston, 1883), and Pickard (1894).

WHITTINGHAM, William Rollinson, D.D., 1805–79; b. New York; graduated at the General Theological Seminary, New York, 1825; ordained, 1827; rector of St. Luke's church, New York, 1831; went to Europe for health, 1834; elected professor of church history in the General theological seminary, 1835; consecrated bishop of Maryland, 1840. During the war of the secession he was a firm friend of the national government, while many of his clergy espoused the southern cause. He edited *The Family Visitor, Children's Magazine, The Churchman, Parish Library of Standard Works*, with prefaces, notes, etc., and published several sermons.

WHITTINGTON, Richard. As the existence of this remarkable man is by many supposed to be wholly mythical, it has been thought not out of place here to state briefly the few authentic facts of his life. Whittington was descended from a good Gloucestershire family, and was born probably about 1350, the younger son of sir William Whittington, who possessed the estate of Pauntley in that county. His father died not long after Whittington was born, and Richard, who had no fortune, set out for London, to endeavor to make one by means of trade. That he left London on account of ill-usage, but was induced to return by his interpretation of the friendly sound of Bow Bells, and that he afterward made his living through the instrumentality of a cat, are stories not improbable, but which cannot be well authenticated. He appears, however, to have apprenticed himself to a mercer, and to have rapidly risen in the world. It is not known at what date he set up for himself, but we find him a member of the Mercers' company in 1392, in which year he was elected an alderman of the city, and in the following year was appointed sheriff. In 1397 Whittington was elected lord mayor of London; was again chosen to fill that office in 1406; was elected member of parliament for the city in 1416; and in 1419, for the third time, filled the office of mayor. These statements accord with the popular story of Whittington's having been "thrice lord mayor of London," although some antiquaries doubt if he filled that office oftener than twice. Whittington, on account of various services rendered to Henry V., received from that sovereign the honor of knighthood. We are not informed of the date of Whittington's marriage; but from various authentic sources we learn that his wife's name was Alice, daughter of sir Hugh Fitzwarren. She appears to have died several years before her husband, and to have left no issue. Whittington died in the spring of 1423, aged about 63 years. There can be no doubt that Whittington was diligent and exceedingly prosperous in business, upright and liberal in character—"a vertuous and godly man, full of good works (and those famous)"—and in many respects considerably in advance of his time. His liberality appears to have been unbounded. At his death, he left the bulk of his property to be laid out in purposes of charity, and in completing those works which had been commenced under his own superintendence. For further details concerning the life of this remarkable man, we refer the reader to the Rev. Samuel Lysons's *Model Merchant of the Middle Ages* (Lond. 1860), an admirable and judicious biography of Whittington; also to various volumes of *Notes and Queries*.

WHITTLE, Francis McNeece, d.d., ll.d., b. Va., 1823; graduated at the theol. sem. of Virginia, 1847; was ordained priest in the Prot. Epis. church, 1848; consecrated asst. bp. of Va., 1868; and assumed the full charge of the diocese at the death of Bp. Johns, 1876.

WHITTLESEY, or Whittlesea, a decaying village and market-t. in Cambridgeshire, 5 m. e. of Peterborough. The population in and about Whittlesey are mostly employed in agricultural pursuits and in brickmaking. *Whittlesea-mere*, a shallow lake, which formerly existed in the n. of Huntingdonshire, 4 m. s.w. of Whittlesey, was 2 m. in length by 1 in breadth, and abounded in fish, water-fowl, etc., is now drained and laid out in fenlands, which are under cultivation. Whittlesey is connected by a branch with the Great Northern and Great Eastern railways. The pop. in '91 was 3556

WHITTREDGE, Worthington, b. Ohio, 1820; became a portrait and landscape painter in Cincinnati. After a residence in Europe, 1849–59, he took up his residence in New York. Among his best-known works are: "Lake George," "Ruins of Tusculum," "The Roman Campagna," and "The Coast of Rhode Island."

WHITWORTH, Sir Joseph, b. England, 1803; studied mechanics and manufacturing in Manchester, and became a large manufacturer. He made valuable inventions in planing machines, etc.; but was best known as the inventor and manufacturer of the Whitworth breech-loading cannons and rifles, which he began to make in 1854. His baronetcy was bestowed on him in 1869. He d. 1887. See Artillery.

WHOOPING-COUGH. See Hooping-Cough.

WHORTLEBERRY. See Huckleberry.

WHY'DAW, or Whidaw, a maritime province of Dahomey (q.v.), on the bight of Benin. It is populous and very fertile, and exports palm-oil, gold-dust, ivory, and many slaves.—The town of Whydaw is the principal seaport of Dahomey, a decaying place, owing to the suppression of the slave-trade. It is still, however, the principal seaport of the kingdom. Pop. formerly 50,000, now under 12,000. It is situated about a mile and a half from the sea, close to a lagoon and a swamp, between which and the sea a sandy neck intervenes. Into the lagoon flow several rivers, known to slave-traders.

WHYDAW BIRD, Whydaw Finch, or Widow Bird, *Vidua*, a genus of birds of the family of weaver-birds (q.v.), having long wings, and a boat-shaped tail, the two middle feathers of the tail of the males excessively lengthened during the breeding-season. The name is derived from the country of Whydaw in western Africa, and widow bird is a mere corruption of it, which, however, has given to the genus its name *vidua* (Lat. widow), regarded as appropriate, because the long tail of the male drops off after the breeding season, and also because of the general dark color of the plumage. The species are natives of the tropical parts of Africa and the s.e. of Asia. They are frequently brought to Europe as cage-birds, both on account of their plumage and the sweetness of their song. The best-known species (*V. paradisea*) is a small bird, about the size of a canary, with black and brownish-black plumage, with a broad collar of orange-rufous color, and breast of somewhat similar color; two feathers of the tail in the male very broadly webbed in the breeding season, and ending in a hair-like shaft, two feathers very much elongated, sometimes a foot in length, and about three-quarters of an inch in breadth.

WHYMPER, Edward, b. London, 1840; at first a draughtsman on wood. Preferring an active life, in 1861 he went up Mont-Pelvoux, then thought to be the highest mountain in France, and from its top discovered the Pointe des Ecrins, the highest of the French Alps which he ascended in 1864. The following year he succeeded in making the ascent of the Matterhorn (14,780 ft. high), though three of his companions and one of his guides were killed. He traveled in Greenland, 1867, finding magnolia cones, and thus demonstrating the former existence of luxurious vegetation in that country. His collection of fossil plants is in the British museum; for a description, see article by Prof. Heer in the *Transactions* of the Royal society for 1869. For his *Scrambles among the Alps in the years* 1860–69, he received from the king of Italy the decoration of chevalier of the order of SS. Maurice and Lazarus. He re-visited Greenland, 1872; ascended the Andes, 1879–80, and was the first known explorer of the heights of Chimborazo (20,517 ft.) and other mountains. The discovery of glaciers on the Andes was due to him. He has published also *The Great Andes of the Equator* (1892).

WHYTE, William Pinkney, ll.d., b. Baltimore, 1824; educated at Baltimore coll., and under private tutors; studied law at Harvard law school, and was admitted to the bar, Baltimore, 1846; was a member of the state legislature, in 1847; state controller, 1853–55; was appointed by the gov. of Md. to fill a vacancy in the U. S. senate, 1868–9; was elected, as a dem., gov. of Md., 1861, and resigned upon being elected to the U. S. senate, 1874, in which he served until 1881; was made attorney-general of Maryland, 1887.

WICHERN, Joh. Heinrich, superintendent of the Rauhes Haus (q.v.), near Hamburg, and known by his exertions in the affairs of the German home mission, was born at Hamburg on April 21, 1808. He attended the gymnasium of his native town, and then studied theology at Göttingen and Berlin. Shortly after passing his examinations at Hamburg, he directed himself to practical usefulness, visited the poor and the wretched in the courts and lanes of the town, and undertook the direction of a free

Sunday-school for poor children, in which he soon gathered round him from 400 to 500 scholars, instructed by 40 voluntary male and female teachers. At this time Wichern declined the offer of a charge in the neighborhood of Hamburg, as he already entertained the idea of an institution such as the Rauhes Haus, which he opened in 1833. From about 1840 Wichern was much engaged with undertakings of a similar kind in Germany, to which his mother institution gave rise. The example was soon followed by France on a great scale (Mettray, near Tours), then by England, Holland, and other countries. It was chiefly through the instigation of Wichern that at the first Protestant ecclesiastical assembly held at Wittenberg in 1848, for the purpose of concerting united action, a central home mission committee was appointed, under which title Wichern had formed the idea of comprehending all exertions on behalf of the poor, the miserable, and the morally and religiously lost. This home mission has exerted a wide and beneficial influence on the n. of Germany, and as a member of the committee, Wichern found in it an extended field for his exertions. Traveling through all parts of Germany, Wichern was the means, by his exhortations, of founding all sorts of institutions and societies for education and the care of the sick, of the poor, and of prisoners. On his return from a visit to England in 1851, the Prussian government commissioned him to inspect all the houses of correction and prisons, to the general supervision of which he was appointed in 1858. Prevented by this constant practical usefulness, he published but little. In his *Home Mission of the German Evangelical Church* (Hamburg, 1849), he explains his views of Christian charity, and its relation to the ecclesiastical and social questions of the day. After 1844 he published his *Fliegende Blätter* (Fugitive Leaves), which contain parts of his discourses at the ecclesiastical diets. In 1851 Wichern received from the university of Halle the degree of D.D. He d. 1881.

WICHI'TA, a co. in w. Kansas, drained by the branches of Smoky Hill river; 720 sq. m.; pop. '90, 1827, of American birth. Co. seat, Leoti.

WICHI'TA, a co. in n. Texas, having the Red river for its n. boundary; drained by the Wichita river; 600 sq. m.; pop. '90, 4831. Co. seat, Wichita Falls.

WICHITA, city and co. seat of Sedgwick co., Kan.; on the Arkansas river, and the Atchison, Topeka, and Santa Fé, the Chicago, Rock Island, and Pacific, the Missouri Pacific, the St. Louis and San Francisco, and the Wichita and Western railroads; 160 m. s.w. of Topeka. It contains Wichita university, Fairmount college, Lewis and All Hallows academies, business colleges, Wichita and St. Francis hospitals, public library, Linwood, Riverside, and Schuman parks, U. S. government building ($200,000), city hall ($100,000), co. court-house ($250,000), Y. M. C. A. building ($75,000), opera house, national and state banks, and about 30 churches. There are gas and electric light plants, electric street railroads, waterworks supplied from driven wells, two large packing-houses (cost $500,000), 70 wholesale houses, and 84 manufacturing firms. Pop. '90, 23,853.

WICK, a royal, parliamentary, and municipal burgh and seaport, capital of Caithnessshire, stands on both sides of Wick Water, at the mouth of that stream, and at the head of an inlet called Wick bay, 16 m. s.s.w. of Duncansby Head, and 18½ m. e.s.e. of Thurso. The parliamentary boundaries include the royal burgh, which, with the suburbs of Louisburgh and Boathaven, lies on the n. side of the river and bay, and Pulteney-town on the s. side; pop. over 5000—the total pop. of the parliamentary burgh being, in '91, 8512. Pulteney-town, a settlement of the British fisheries society, is a flourishing town managed by improvement commissioners. The bay is about a mile long by half a mile broad, exposed to frequent storms from e. and n.e. There is an excellent tidal harbor of considerable capacity, the property of the said society. The institutions within the parliamentary burgh comprise a county court-house and prison, 9 churches and chapels, a town-hall, the Pulteney-town academy, and a chamber of commerce. For the last half century Wick has been the headquarters of the herring-fishery in Scotland.

WICK, the material used for the center of candles and lamps, which, from its porous nature, draws up the oil by capillary attraction in such quantities as to burn easily. Usually, wicks are made of cotton, but formerly flax, hemp, and rushes were used. For ordinary candles the wick consists of a bundle of cotton thread, lying parallel with each other, but for wax, spermaceti, paraffine, stearine, etc., they are usually of twisted or plaited cotton. See CANDLE.

WICK-I-UP, the name used by the Indians of the Northwest to designate a temporary hut made of saplings and leaves. See TEPEE, WIGWAM.

WICKLIFFE, JOHN. See WYCLIFFE.

WICKLOW, a maritime co. of the province of Leinster, Ireland, is bounded on the n. by the co. of Dublin, e. by the Irish channel, s. by the co. of Wexford, and w. and s.w. by the counties of Carlow and Kildare. Its greatest length is 40 m., and greatest breadth 33; the total area being 781 sq. m., or 500,178 acres. The pop. in 1851 was 92,978; in 1881, 73,553, of whom 58,571 were Roman Catholics, 13,722 Protestant Episcopalians, and the rest Protestants of other denominations; and in 1891, 62,136. The coast-line stretches in a southerly direction about 39 m., is in many parts precipitous, and being, moreover, obstructed by sandbanks, is very dangerous for shipping. The surface ascends in some parts most abruptly from the sea, and a large portion is mountainous and unproductive. The Wicklow mountains, however, form rather a group than a range, and on the western and north-western side, decline less precipitously toward the central

plain. The most elevated point is Lugnaquilla, which is 3039 ft. above the level of the sea. Several other peaks approach this elevation, and the glens which lie between the several mountains or groups are exceedingly picturesque, especially Glencree, Glendalough, Glenmalure, Ismail, the glen of the Downs, Devil's glen, and Ovoca, the scene of Moore's well-known Irish melody, *The Meeting of the Waters*, whence the Ovoca river flows, to fall into the sea at Arklow. The valleys are, for the most part, of limited extent; but some plains of considerable size lie upon the eastern and southern shore. The lakes, although strikingly beautiful, are few in number, and of small size, the principal being loughs Dan, Bray, and Tay, and the loughs of Glendalough and the rivers, some of which drain the eastern, and others the western slope, are little more than mountain streams, at least so far as their course lies within the limits of this county. The Liffey and Slaney rise in Wicklow, but do not reach any considerable volume until after they have issued from it. The great central group of mountains is a mass of granite, which protrudes through mica and clay slate, to which latter formation the minor elevations both on the eastern and the western side generally belong. The granitic protrusion, which is one of the most remarkable and best defined in the kingdom, falls away on the e. side toward the sea, and on the w. toward the great central limestone. The minerals of Wicklow are numerous and varied in character. In the granite and mica-slate are found galena, green and white lead ore, and copper pyrites. From the clay-slate tract are obtained gold, silver, copper, iron, lead, zinc, tin, tungsten, manganese, arsenic, and antimony. The quantity of gold found is very small. Silver is found in combination with lead, which is raised with great success and profit at Glenmalure. The copper mines also are very productive; and of late years the utilization of the sulphur, which was formerly wasted, has added largely to the profit of the mining operations.

The climate resembles that of Wexford (q.v.). The soil is very various in character. In the mountains it is thin and poor, but generally dry, although there is a considerable proportion of bog. In the valleys and level districts, the subsoil is generally gravel, and the soil is for the most part either dry, or, even in the boggy districts, susceptible of drainage. On the whole, in the lowlands, the soil is moderately fertile; but there is little cultivation of wheat, the chief agricultural pursuits being dairy-farming and grazing; and the culture, on a limited scale, of barley, oats, turnips, and potatoes. Except in the Ovoca district, where there are important mining industries, the occupations of the people are purely agricultural. The fisheries are almost wholly neglected; and the manufacture of flannels, once extensive, is now nearly extinct. There is a large number of villas, with extensive and highly cultivated parks, especially in the picturesque district which lies between Bray and Wicklow. The county is divided into eight baronies. The chief towns are Wicklow, Bray, Arklow, and Baltinglass. Wicklow returns two members to parliament, one for the eastern and one for the western division.

WICKLOW, a seaport, capital of the above co., is situated at the mouth of the river Vartrey, n. lat. 52° 58′, w. long. 6° 3′, 32 m.s.s.e. from Dublin, with which city it is connected by the Wicklow, Wexford, and Waterford railway. The pop. in 1881 was 3391, of whom 2000 were Catholics, 600 Protestant Episcopalians, and the rest of other denominations. Pop. '91, 13,273. It is an assize town. Although it is a seaport the export trade is extremely small; nor are the fisheries of much value. The principal exports are the products of the mining operations and the agricultural produce of the district. The streets are narrow and ill built, nor is there any public building deserving of notice.

WICOMICO, a co. in s.e. Maryland, having the Pocomoke river for its e. boundary, the Nanticoke on the n.w., Chesapeake bay on the s.w.; drained by the Wicomico; 369 sq. m.; pop. '90, 19,930. Co. seat, Salisbury.

WICOPY. See LEATHERWOOD.

WIDDIN, or VIDIN (anct. *Bononia*), formerly an important Turkish fortress, is now a t. in Bulgaria, on the right bank of the Danube, 16 m. from the Servian frontier, and is surrounded on the land side by morasses. Its streets and bazars are pestiferously dirty. For centuries Widdin has been a strong post in all the contests between the Turks and their northern neighbors, and it was called by the Turks the Virgin fort, from its never having been taken. Widdin has thriving industries and trade, leather work and gold and silver filigree numbering among its specialties. The Berlin congress of 1878, which erected Bulgaria into a principality, determined that the extensive fortifications of Widdin and other Bulgarian fortresses should be demolished. Pop. '88, 14,772.

WIDGEON, or WIGEON, *Mareca*, a genus of ducks of the non-oceanic section, with the hind-toe not webbed, having the bill shorter than the head, and of equal width throughout, much rounded at the tip, with a broad strong nail; the lamellæ of the upper mandible prominent; the wings long and pointed; the tail wedge-shaped. The species are pretty numerous, migratory birds, appearing in great flocks in the warmer countries which they visit during the winter. The COMMON WIDGEON (*anas* or *mareca penelope*) is plentiful in Britain during winter. A few breed in the most northern parts of Scotland, but the ordinary breeding-place is in more northern regions. This species is

found at some season of the year in almost all parts of Europe, and in Asia as far s. as the n. of India. It is found also in North America, along the Atlantic coast. It is known as one of the birds of Japan. Its whole length is about 18 inches. The forehead and top of the head in the male are white, the cheeks and hind-part of the neck reddish chestnut; the upper parts grayish white, crossed with irregular zigzag lines of black; the tail nearly black; the wing coverts white, tipped with black; the primaries dark brown; a green speculum edged with black; the throat, pale rufous; the breast and belly, white. The female is very different, the head and neck rufous brown, speckled with dark brown; the back varied with two shades of brown, darker in the center, and paler in the edges of the feathers. The widgeon is the most common of all the duck tribe in Lapland, frequenting grassy swamps, lakes, and rivers. Flocks of widgeon appear in Scotland and England, on lakes and rivers, in winter, and most abundantly in severe winters. They feed during the day time, and chiefly on grass. The note of the Widgeon is a shrill whistle, whence its French name *siffleur*, and the English names, *whew duck* and *whewer*. Its flesh is good for the table.—The AMERICAN WIDGEON (*anas* or *mareca Americana*) is a larger bird than the European widgeon, being about 23 in. long. The upper parts are finely waved transversely with black and reddish-brown, the under parts are mostly white; the top of the head is almost white; the wing-coverts white, the greater tipped with black; the speculum green, encircled by black. It breeds chiefly in the northern parts of America, and is common in winter on the coasts of the United States, and in the rice-grounds. Its flesh is highly esteemed. It rarely visits Great Britain. See illus., LARKS, ETC., vol. VIII.

WIDOR, CHARLES MARIE, composer, b. in Lyons, France, Feb. 22, 1845. He studied the pianoforte and organ under Lemmens in Brussels, and composition under Fétis. In 1860 he became organist of the church of Saint-François, Lyons, and in 1869 of Saint-Sulpice, Paris. He is one of the most celebrated of all organists and a distinguished composer of the modern French school. His works are: *Maitre Ambros*, opera, Paris, 1886; *La Nuit de Walpurgis*, symphonic poem; Psalm CXII. for two choruses, two organs and two orchestras; *Marche Nuptiale* for orchestra; Concerto for pianoforte with orchestra; six symphonies for organ; chamber music; pianoforte music, and songs.

WIDOW, see JUS RELICTÆ, SUCCESSION, MARRIAGE, DOWER.

WIDOW-BIRD. See WHYDAW BIRD.

WIELAND, CHRISTOPH MARTIN, one of the greatest of German poets, was born, Sept. 5, 1733, at Oberholzheim, near Biberach, his father being pastor of that place and afterward in Biberach itself. The precocity of his powers early excited attention, and when only 12 years of age, he had essayed his poetical talent both in Latin and in German verses. In 1750 Wieland went to the university of Tübingen to study law, but occupied himself more with the classics, and with recent literature both native and foreign. From Tübingen, he returned to Biberach in 1752. At this time, Klopstock's example had an extraordinary influence on him, so that he gave himself up to a mystical piety, foreign to his nature, which he gives utterance to in the *Empfindungen des Christen* (The Christian's Experiences). While in this mood, an invitation from Bodmer led him to give up the intention of graduating at Göttingen, and go to Zürich. The number and nature of his productions at this time show the effect which the example of Bodmer's desultory way of working was beginning to have upon him. He soon, however, returned to the more congenial field of the literature and life of the Greeks. The lively interest which he took in Frederick the Great prompted Wieland to work out the ideal of a hero in a great poem, for which purpose he fixed on Cyrus. The first five cantos appeared, 1757, and a new edition, 1759; but the reception it met with was not very cordial, and consequently it remained unfinished. The beautiful episode from the *Cyropaideia* of Xenophon, *Araspes und Panthea*, appeared about this time, and revealed Wieland as the poet of love. In 1760 he received an appointment in his native town in connection with the law-courts. At this period he engaged in the arduous task of translating Shakespeare (8 vols. Zür. 1762–66). However little Wieland, whose mind had been formed after Greek, Roman, and French models, and who was constitutionally inclined to pleasant and easy trifling, was calculated to enter fully into the spirit of Shakespeare, he nevertheless was, for his time, tolerably successful, and opened up the path for his successors.

Wieland now spent much of his time at Warthausen, near Biberach, the estate of the count von Stadion, an accomplished and highly intellectual man, but thoroughly a man of the world, and averse to all religious enthusiasm. From the tone of the society he met here, as well as by the course of his reading, Wieland became imbued with that modern French philosophy which runs through the most of his later writings. In some of these, there is an unmistakable tendency to licentiousness, from which his personal life always remained free; in most of them, however, he has blended the Greek sensibility to outward impressions with the French love of pleasure into a peculiar graceful philosophy of life. The first production which bears the impress of this French-Greek sensuousness, was the poetical tale *Nadine*, which he himself calls a creation in Prior's manner. In 1766 and 1767, *Agathon*, a romance in 3 vols., made its appearance, which greatly contributed to establish Wieland's fame. His views on the subject of love are most fully and worthily expounded in the didactic poem *Musarion* (1768), a work of

singular grace and harmony of treatment, which he himself called a philosophy of the Graces. Wieland had, in the meanwhile (1765), married a lady of Augsburg, and accepted a call to Erfurt (1769), as professor of philosophy in the university. He terminated what may be called the erotic period of his literary career with the *Verklagter Amor* (The Impeachment of Love), wherein he, in a manner, vindicated the kind of poetry to which he had till then devoted himself.

A period of delightful leisure and undisturbed work began for Wieland when the widowed duchess Anna Amalie invited him to Weimar (1772), as tutor to her two sons, with the status of hofrath, and a salary of 1000 thalers, which was continued to him after his duties as tutor ceased. Wieland was entirely in his own place in the society of the distinguished men (such as Musäus and Von Einsiedel) already gathered round this court; and his genius began to soar more courageously. He wrote his vaudeville *Die Wahl des Hercules* (The Choice of Hercules), and the lyrical drama, *Alceste* (1773), which were received with great approbation. Of greater importance for German literature was the publication of the *German Mercury*, a monthly periodical, to which Wieland, till toward the close of his life, devoted himself with the greatest earnestness, and which he made the vehicle for disseminating his æsthetical views. On the whole, however, his criticism was neither genuine nor very deep, and suffered from that conventional narrowness which was then dominant in France. His letters on his *Alceste* in the *Mercury* (Sept., 1773) contains sufficient traces of this tendency, at which Goethe and Herder were so much offended. The former wrote in relation to it the satire *Götter, Helden, und Wieland* (Gods, Heroes, and Wieland). Wieland answered the attack with pleasantry and with his characteristic good nature. Shortly afterward, Goethe himself joined the circle at Weimar, the soul of which was the duchess-mother, Anna Amalie. Wieland's literary powers developed themselves here more and more; and for more than 20 years, almost nothing of any importance occurred, either in the political or literary world, in which he did not take a more or less active part. His literary productiveness showed itself chiefly in the *Geschichte der Abderiten* (History of the Abderites, 1774), a charming work, depicting the follies of small communities, in which the muse of Wisdom is disguised under the garb of the Satyr. This was followed by a series of tales and stories, partly imitations of foreign originals, and partly of his own invention. *Oberon*, a romantic heroic poem, the most perfect and enduring of his greater works, appeared 1780 (last ed. Leip. 1853). It was followed by the translation of Horace (*Letters*, 1782; *Satires*, 1786) and of Lucian (1788). Wieland pronounced the *Epistles* of Horace with the commentaries to be those of his works on which he put the greatest value. He has given us a complete sketch of his conception of the Greek world in the *Aristipp* (1800). A collected edition of Wieland's works up to 1802, in 36 vols., with 6 supplementary vols. in large quarto, and large and small octavo (new edition with the poet's life, 53 vols., 1828; 36 vols., 1839), was got up by the bookseller Göschen in Leipsic. From the proceeds, Wieland was enabled to buy the estate of Osmannstädt, near Weimar. From 1798 to 1803, he lived here in the circle of his numerous family (his wife, in the course of 20 years, had brought him 14 children), and devoted the geatest part of his time to literary labors, among which his *Attic Museum* (1796–1804) and the *Neue Attic Museum* (1805–9) were not the least. In these publications, he strove to make his countrymen familiar with Greek poetry, philosophy, and rhetoric. In 1803 he sold his estate, and returned to Weimar, where he very soon became intimate with Schiller. Here he lived to see the day of the battle of Jena, the death of the duchess Amalie, and also of Herder and Schiller. The marks of honor which he received from Alexander and Napoleon, and his admission to the French "Institut," helped to alleviate his many griefs, among which one of the greatest was the death of his wife, 1801, with whom he had lived for so many years in great happiness. His own death took place Jan. 20, 1813.

Wieland had neither the spirit of a reformer like Klopstock and Lessing, nor did he attain the poetical greatness of Goethe or Schiller; nevertheless, he did great service to German literature, which has not always been sufficiently recognized. He gave to German poetry, as it was rising into true national importance, the still wanting grace and harmony of expression and versification, in which respect Goethe learned much from him. The poetic handling of mediæval chivalry was an entirely new creation of his, and thus the school of romantic poetry is indebted to him for its origin. He also introduced poetical materials from England, France, Spain, and Italy, which were not without influence. In all his appropriations Wieland exercised that fine discernment which seizes upon what is universally human, so that he nowhere appears as a blind imitator. His criticism, too, with all its shallowness, contributed much to the diffusion of general culture.—Compare, besides Gruber's *Biographie Wieland's* (4 vols., Leip. 1827; vols. 50–53 of the *Works*), *Wieland's ausgewählte Briefe* (4 vols., Zür. 1815), *Auswahl denkwürdiger Briefe* (2 vols., Wien, 1815), and *Briefe an Sophie Laroche* (Berl. 1820); also Löbell's *C. F. Wieland* (1858).

WIELICZ'KA, small t. of Austrian Galicia, 8½ m. directly e.s.e. of Cracow by railway. It is remarkable for its salt mines, in which the majority of its inhabitants are employed. Pop. '90, 6037.

town itself is entirely undermined by the excavations, which extend upward of 9,590 ft. from e. to w., 3,600 ft. from n. to s., and are 1780 ft. in depth. The mines extend to four stories or "fields," one below the other. In the second story, the visitor is rowed across a salt lake, and when he has reached and is exploring the third story, he is informed that the lake he lately crossed is now right above his head. The stories are simply large chambers excavated in one enormous mass of rock-salt, of great purity, and apparently of inexhaustible extent. In one of the chambers, the miners have scooped out a Gothic chapel, and skillfully carved a number of statues and obelisks from the solid rock-salt. The mines produce 61,500 tons English per annum.

WIENAWS'KI, HENRI, 1835–80; b. Poland; educated at the Paris conservatory, where he was a pupil of Clavel and Massart on the violin; and afterward studied harmony with Colet. He began to give concerts in 1852, and soon won a high reputation as a violinist. He visited the United States with Rubinstein in 1872. He subsequently became a professor in the Brussels conservatory. He has written many compositions for the violin.

WIERTZ, ANTOINE JOSEPH, 1806–65; b. Belgium; studied art in Antwerp and at Rome, returning to Brussels in 1865. In the earlier part of his career Wiertz produced several pictures biblical or mythological in subject, and of colossal size, such as "Contending for the Body of Patroclus" and "The Triumph of Christ." He was a man of undoubted genius, though eccentric and with a strong taste for the grotesque. On one occasion he sent a genuine Rubens to a Paris exhibition marked with his own initials. It was promptly rejected, and he did not fail to turn the rejection into ridicule. His studio, built for him in 1847 by the Belgium government, is still open to the public, and contains all his paintings, many being specimens of the *peinture mate*, a combination of fresco and oil painting by which many startling effects are produced.

WIES'ELBURG (Magyar, *Moson*), a co. in w. Hungary, drained by the Danube, Rabnitz, and Leitha rivers; 786 sq. m.; pop. '90, 85,050. Capital, Ungarisch-Altenburg.

WIES'BADEN, chief t. in the Prussian district of the same name, in the province of Hesse-Nassau (formerly the independent duchy of Nassau), one of the oldest and most famous of the German watering-places, delightfully situated on the s. slopes of Mt. Taunus, 26 m. w. of Frankfort, and 5 m. n.w. of Mainz by railway. The town has been called "a city of lodging-houses," and this may be understood from the fact that during the "season" the number of the visitors is greater than that of the resident inhabitants. But though almost every house is appropriated to the reception or entertainment of guests, the town is well and regularly built. The *kursaal* comprises an extensive dining-hall, in which frequently 300 people sit down to dinner, and which also serves as a ball-room, together with good reading-rooms, etc. In the large gardens behind the *kursaal*, it is the habit of the visitors to sit in the evenings at their numerous small tables, regaling themselves with coffee or ices—the men smoking, the women knitting—and all either chatting or listening to the music played by a band on such occasions. Other buildings are the *Schlösschen* (little palace), containing a library and a collection of antiquities, in which are a number of curious Roman *bassi-relievi*, statues, altars, etc., found in the vicinity; the handsome Protestant church, finished in 1862; the superb Greek chapel, built by the duke of Nassau as a mausoleum, in which repose the remains of his first wife. There are 14 hot springs, all of a high temperature, and numerous bathing-houses throughout the town; but the principal is the *kochbrunnen* (boiling-spring), the temperature of which is 156° Fahr. The spring has all the appearance of a boiling caldron, and so copiously does it pour forth its waters, that, though they are used both for drinking and to supply the principal baths in the town, a vast quantity escapes, and runs away through gutters and drains, sending up clouds of vapor in its passage along the streets, and adding to the warmth of the temperature of Weisbaden in summer. Next in heat and volume to the *kochbrunnen* is the spring that rises in the garden of the *Adler* (Eagle) hotel, the temperature of which is 134° Fahr. The use of the Wiesbaden hot-springs is considered highly efficacious in cases of gout, rheumatism, scrofula, and other skin diseases and nervous affections. The waters of these springs are saline, and contain silica and iron. The prosperity of Weisbaden is entirely due to its springs; and the beauty of its situation and environment, the agreeable walks and rides, and the never-failing gayety that prevails during the season, render it one of the most popular of the spas. The season lasts from June to September, and, though the public gaming-tables were abolished in 1872, the number of visitors annually is near 40,000. Pop. '90, 64,670.

Wiesbaden is very ancient; its springs are the the *Fontes Mattiaci* mentioned by Pliny. The Romans built a station here, and erected a fort on a hill on the n.w. side of the town, still known as the Römerberg, and which was garrisoned by the 22d Roman legion. The *Mattiaci*, a subdivision of the German tribe called the *Catti*, allied themselves with the Romans; but in the 3d c. the barbarian Germans rose against the Romans, and destroyed their forts, including Wiesbaden. Urns, tiles, coins, etc. are found abundantly whenever the foundation of a house is dug; and that the Romans appreciated the virtues of the waters is proved by the remains of ancient baths that have been found, and by the votive tablets recording the thanks of Romans who had been restored to health by the waters, still preserved in the museum.

WIG (Lat. *pilus*, the hair; *pilare*, to pluck off the hair; from which was formed *pilucare*, and hence *pilucca*, a head of hair: this was transformed in Ital. into *perruca*, Fr. *perruque*, whence Eng. *periwig*, shortened into *wig*). The use of false hair for concealing baldness, or for the supposed adornment of the head, appears to belong to all ages and countries. There is an Egyptian wig in the British museum, supposed to be about 4,000 years old; and some of the South sea islanders are said to be skillful wig-makers. Xenophon mentions that Astyages wore an immense wig. Several of the Roman emperors wore wigs, and Lampridius relates that the wig of the emperor Commodus was highly perfumed, and sprinkled with gold dust. After this there are no historical traces of the wig till about the end of the 14th c., when wigs made their appearance in France, and hence spread gradually over other European countries. The fashion of wearing wigs set in strong in the reign of Louis XIII. (1610–43), and for more than a century no gentleman of fashion could appear without one. Such was the extravagance in this article of dress that as much as three guineas an ounce was paid in England for fine qualities of hair, and wigs were made at a cost of £140. In was only toward the end of the 18th c. that the unnaturalness of this ornament appears to have been thought of, and it began to be superseded by the queue with hair-powder (q.v.). Except by judges and barristers, wigs are now used only in cases of baldness, and then they are made in imitation of nature, which was by no means the case with the wigs of old times.

WIG'AN, a prosperous market and manufacturing t., and municipal and parliamentary borough, in Lancashire, on the Douglas, 15½ m. s.s.e. of Preston, and about the same distance from Liverpool on the s.w., and Manchester on the s.e. Originally rather irregularly built, Wigan has for some years progressed rapidly in the improvement of its streets and buildings. It is well sewered and liberally supplied with water. The parish church of All Saints is an ancient stately edifice, and has recently been almost entirely rebuilt. There are 21 churches and chapels belonging to the establishment; 9 Roman Catholic, and 21 other dissenting places of worship. Pop. '81, 48,194.

WIGGER, Winand Michael, d.d., b. New York, 1841; graduated, St. Francis coll., N. Y., and studied Rom. Cath. theology at Seton Hall sem., N. J., and at Genoa, Italy. He was assistant in St. Patrick's cathedral, Newark, N. J., 1865–69; was appointed rector of St. Vincent's church, Madison, N. J., 1869; of St. John's, Orange, N. J., 1873; of St. Theresa's, Summit, N. J., 1874; and again of St. Vincent's, 1876. He was consecrated bp. of Newark, 1881.

WIGGLESWORTH, Edward, 1742–1826; b. Mass.; grandson of Michael, and graduate of Harvard in 1761. He received a colonel's commission from the provincial Congress of Massachusetts in 1776; and the same year held an important command in Arnold's lake Champlain squadron. He was col. of the 13th Massachusetts regiment, 1776–79. Washington appointed him collector of Newburyport.

WIGGLESWORTH, Michael, 1631–1705; b. England; came with his father to America, 1638; graduated, Harvard college, 1651; tutor and fellow; studied divinity; minister at Malden, Mass., 1656; remaining till his death. He declined the presidency of Harvard college, 1684. He published a poem—*The day of Doom, or a Poetical Description of the Great and Last Judgment, with a Short Discourse about Eternity*—very popular, passing through several editions; *Meat out of the Eater*, another popular poem. He left in MS. a poem on *God's Controversy with New England*, now printed in the *Proceedings* of Massachusetts historical society.

WIGHT, Moses, b. Boston, 1827; studied painting in Italy, after his return from which he practiced his profession in Boston. He afterward studied *genre* painting at Paris with Couture. Among his portraits are "Agassiz" and "Everett," among his *genre* pictures are "Lisette" and "The Old Cuirassier."

WIGHT, ISLE of, an island in the English channel, remarkable for the variety and beauty of its scenery, and the mildness and salubrity of its climate, lies almost centrally, close off the southern coast of England, in which it is partially embayed, and is divided from it by a channel varying from less than 1 m. to more than 6 m. in breadth, known as the Solent (q.v.), which spreads out to the e. into the broad and safe anchorage of Spithead (q.v.) and St. Helen's roads. Its form is remarkably regular, its longer and shorter diameters (22 m. 5 furlongs, and 13¾ m. in length respectively) running almost due e. and w., and n. and south. Its shape is rhomboidal, and has been compared to a bird with expanded wings or to a turbot. It is 56 m. in circuit, and embraces an area, including its inlets, of 98,320 acres. Pop. '91, 78,718. Newport (which returned one member to parliament until 1885, when it was disfranchised) is the capital; the other chief towns are Ryde, Cowes, and Ventor (all described under their separate headings), of which the first and last have sprung up from small villages within the present century. Yarmouth is a small decayed t. near the western extremity of the island, formerly returning two members, a privilege once also possessed by Newtown on the n. w. coast, a once important town, now sunk to an insignificant hamlet. On the s.e. coast, the delightful health-resorts of Sandown and Shanklin have lately acquired the size and importance of towns. Railway communication has been opened between Ryde and Ventnor, and between Cowes and Newport. Throughout the island there are good though generally narrow roads, for the most part picturesque and bounded by hedgerows. The chief physical feature of the island, to which it owes its shape and much of its beauty, is a

long undulating range of chalk downs, extending, as a kind of backbone, from the Culver cliffs on the e. to the Needles on the w., rising to its greatest elevation in Mottiston down, 661 ft. (Ashey down is 424 ft., and Bembridge down 355 ft.) above the sea. The river Medina, rising near the southern extremity of the island, flows n. through a gap in this range, expands into a tidal estuary below Newport, and flows into the Solent at Cowes, and divides the island into the hundreds of the e. and w. Medine. In addition to the central ridge, a second range of chalk downs, of greater elevation—St. Boniface down, 783 ft., Dunnose (Shanklin down), 771 ft., St. Catherine's, 769 ft.—rises at the southern point of the island, and expands into a broad promontory, the s. face of which forms the picturesque district known as the Undercliff, or "back of the island," of which Ventnor is the capital. This district owes its remarkable beauty to a series of land-slips on a gigantic scale, of prehistoric date, which have laid bare a long wall of rugged cliff, below which a succession of sunny terraces, due to the gradual subsidence of the strata, slope gently down to the sea. The whole of this part of the island is completely sheltered from the colder winds, and enjoys a well-merited reputation as a residence for invalids suffering from consumption or any disease of the respiratory organs. Its remarkable healthiness is attested by the returns of the registrar-general, which prove that the death-rate of the district is absolutely the lowest in the kingdom; while the mildness of its climate is evidenced by the luxuriance of the myrtles, fuchsias, sweet-scented verbenas, and other exotics, which live through the winter without protection.

In a geological point of view, the Isle of Wight is most interesting. The great variety of strata displayed within so small an area, under circumstances so favorable for examination, renders it one of the best available localities for the young observer. The n. side of the island presents a succession of tertiary or eocene strata, including beds of fresh-water limestone, which have been extensively worked for building-stone for many centuries, and based on beds of London and plastic clay. In Alum bay, at the w. extremity of the island, the rapid succession of vertical layers of sand and clays of bright and varied hues, produce a singular and beautiful effect. The central ridge or backbone consists of strata of chalk imbedding layers of flints, and the underlying formation in an almost vertical position. Isolated masses of chalk that, in consequence of their superior hardness, have survived the marine and atmospheric waste, form the well-known Needles, at the w. opening of the Solent, and the picturesque rocks of Freshwater bay. The downs at the s. of the island belong to the same formation, but here the strata have been undisturbed, and are nearly horizontal. The cliffs of the Undercliff are of the upper green-sand or firestone, underlying the chalk. Below this comes the gault or blue marl. To the action of the land-springs upon this unctuous formation, the land-slips to which the back of the island owes its beauty are due. The lower green-sand succeeds the gault, occupying the greater part of the area between the n. and s. chalk downs. This forms excellent corn-land, and presents a wall of cliff to the sea, diversified with many narrow picturesque gorges, locally known as chines, where a small rivulet has eaten away the friable strata. The chief of these are those of Shanklin, Luccombe, Blackgang, and Whale chine. The fresh-water wealden formation is the lowest visible in the island, and is seen in the cliffs of Brook to the w., and of Redcliff bay to the east. Bones of the colossal iguanodon and other saurians are found in this formation.

The soil of the island is very varied, both in nature and fertility. That of the northern half is, to a considerable extent, a cold, stiff clay, more suited for the growth of wood, especially oak, than corn. Of late years, however, much of the woodland has been cleared, and judicious draining operations, in which the late prince consort led the way on the royal domain of Osborne (near East Cowes), have produced very beneficial results. Farming is still on the whole somewhat primitive; even on large farms the flail may still be seen in use. The soil of the s. half is chiefly a red loam, which is exceedingly productive, especially in crops of barley, and, in the more rich and sheltered lands, of *white* wheat. *Red* wheat is grown in abundance in other parts of the island; while the stiffer clays of the n. grow capital crops of oats. The chalk downs afford admirable pasturage for sheep, which are celebrated for the pureness of their wool, chiefly exported to Yorkshire, and which furnish the London market with early lamb. The chief exports are wool, corn, flour, cement stones (septaria), and white glass-house sand. The principal communication between the mainland and the island is by steamboats plying daily between Portsmouth and Ryde, at both of which places there are good landing-piers.

The *history* of the Isle of Wight presents but comparatively few points of interest. It is supposed, with much probability, to have been the tin mart of the Greek traders mentioned under the name of *Ictis* by Diodorus Siculus. The Romans knew it as *Vecta* or *Vectis*, which is merely the Latinized form of the native name. It was conquered for the Romans by Vespasian in the reign of Claudius (43 A.D.). Cerdic, the founder of the kingdom of Wessex, took the island 530 A.D., and handed it over to his nephews, Stuf and Wihtgar. In 661 A.D. it was reduced by Wulphere of Mercia, and given to Ethelwold, king of Sussex, from whom it was wrested (686 A.D.) by Ceadwalla of Wessex, to whom, under the benign influence of Wilfrid, archbishop of York, the island owes the introduction of Christianity. During the three centuries preceding the Norman con

quest, it was repeatedly devastated by the Danish pirates, who made it their stronghold, to which they retired with their plunder. William the Conqueror gave it to his kinsman, Fitz-Osborne; Henry I. transferred it to the family of De Redvers, in whose hands it remained till the reign of Edward I., when it passed by sale to the crown During the French wars of Edward III. and his successors, the island was repeatedly invaded and pillaged by the French. At the close of the reign of Henry VIII., the armada dispatched by Francis I., under the command of D'Annebault, made several landings on the coast, and inflicted some damage, but were ultimately driven back by the prowess of the islanders. The most interesting event in the history of the island is the imprisonment of Charles I. in the castle of Carisbrooke, after his flight from Hampton court, from Nov. 23, 1647, to Sept. 15, 1648. Carisbrooke was also the place of the imprisonment of his children, prince Henry and the princess Elizabeth, the latter of whom died there, and was buried in Newport church, where a beautiful monument by baron Marochetti has been erected to her memory by queen Victoria.

Among the celebrated natives of the Isle of Wight we may notice Dr. Robert Hooke, the experimental philosopher, born at Freshwater, 1635; and Dr. Thomas Arnold of Rugby, the regenerator of public-school education, born at East Cowes, 1795.

The antiquities are not numerous. Sepulchral barrows occur on the downs, and Saxon burial-places have been discovered in several localities. There are the remains of a Roman villa, with a tesselated pavement, at Carisbrooke. The remains of Quarr abbey, near Ryde, are very scanty. Carisbrooke castle is a fine ruin, occupying a commanding position. The churches are picturesque, but not remarkable for beauty of architecture. There are but few monumental brasses or other sepulchral memorials of interest.

WIGHTMAN, William May, d.d., ll.d.: 1808–82; b. S. C.: graduated at Charleston college, 1827; admitted to South Carolina Methodist Episcopal conference, 1828; supplied several churches; was agent for Randolph Macon college, Virginia; professor of English literature there, 1837; presiding elder, 1839; editor of the Charleston *Southern Christian Advocate*, 1840–54; member of the Louisville convention which organized the Methodist Episcopal church, South, 1845; president of Wofford college, Spartanburg, 1854; chancellor of the Southern university, Greensboro, Ala.; elected bishop of Methodist Episcopal church, South, 1866. He published the life of bishop Capers.

WIGTON, a market and small manufacturing t. of Cumberland, in the midst of a specially agricultural district, 11½ m. by railway s.w. of Carlisle. It carries on manufactures of ginghams and checks. The harbor, which belongs to the port of Ayr, can accommodate vessels of 300 tons burden. It was a constituent of parliamentary boroughs until 1885, when it was merged in the county. Pop. '81, 3948; '91, 3836; parliamentary district of the county, about 36,000.

WIGTOWN, a co. forming the s.w. corner of Scotland, is bounded on the w. by the Irish channel, n. by Ayrshire, e. by the stewartry of Kirdcudbright and the Solway firth, and s. by the Irish sea. Its extent from e. to w. is computed at from 32 to 34 m., and from n. to s. 24 to 28 miles. This county, which constitutes West Galloway, was formed about the year 1341, and is between 54° 38′—55° 4′ n. lat., and 4° 16′—5° 6′ w. longitude. Wigtown is somewhat irregular in form, being deeply intersected by two arms of the sea, one of which, loch Ryan, a long, narrow inlet, stretches southward from the n.w. corner for fully 9 m. into the county, while Luce bay on the s. makes a wide indentation 15 m. long with an average of 12 wide, the heads of the inlet and bay being only 6 m. apart. The coast-line is about 120 miles long, and the inlets are rocky and unsafe for vessels, but loch Ryan is a good harbor. The western part of Wigtown, known as the *Rhins of Galloway*, thus forms a peninsula whose length (from n. to s.) is 28 m., and breadth 1½–6 m.; its northern extremity is Corsewall point, and its southern the Mull of Galloway, each promontory being provided with a light-house. The south-eastern half of Wigtown is separated from the stewartry by Wigtown bay, 15 m. long and 14 m. wide at its mouth, and between this latter and Luce bay, Wigtown extends southward in a blunt triangular form, terminating in Burrow Head. The inhabitants of Wigtown were originally of Celtic origin, and up to the middle of the 16th c., a Celtic dialect was universally spoken; and for a century afterward it was in use in the remote districts. Wigtown is irregular in its surface, but its eminences are inferior in height to those of any other county of Scotland—none of them exceeding 500 feet. The soil is varied, and—with the exception of a portion lying along the sea-shore, especially in the s.e., which consists of a rich loam—the quality is mostly inferior. There is a large extent of moss and moor, mostly of a very poor and unproductive nature, judging from the appearance and produce of much of what has been reclaimed. There has, however, been a considerable improvement made of late years in farm-buildings. The climate is rather mild, but moist, the rainfall being comparatively great. There are many dairy establishments in this county, almost exclusively for making cheese similar to the Somersetshire cheddar. The Galloway cattle, a hornless breed and among the finest in Scotland, are raised in the county; and although cattle-raising is the most important occupation, agriculture is carried on extensively. Beets and potatoes are raised in large quantities, and among the cereals oats and barley are the most important. Mining and manufactures are unimportant. The chief towns are Stranraer and Wigtown, the capital.

Besides numerous small streams, Wigtown contains three rivers of considerable size, the Cree, which forms the eastern boundary, and the Bladnoch—both of which fall into Wigtown bay—and the Luce, which empties itself into Luce bay; the former two are navigable for a few miles, and yield salmon and trout. The county also possesses several small fresh-water lochs. In the Rhins of Galloway, on the s.w., is situated the parish of Kirkmaiden, the most southerly point in Scotland—hence "from Maidenkirk to John o' Groat's." There were at an early period a considerable number of religious houses in the county; and the church, believed to be the oldest in Scotland, founded by St. Ninian, was built near the site of what is now the village of Whithorn. Pop. '81, 38,602; parliamentary constituency (1881–82), 1700.

WIGTOWN, a royal, municipal, and parliamentary burgh, market-town, and seaport in the s.w. of Scotland, capital of the county of Wigtown or West Galloway, is situated on Wigtown bay, near the mouth of the Bladnoch water. It is 40 m. w.s.w. of Dumfries, and nearly 150 m. distant by railway from Edinburgh. The parish church was erected in 1852. It is of Gothic architecture, and much superior to the ordinary run of country churches. In the church-yard there are three tombstones in memory of martyrs who suffered in the time of episcopal persecution. Two of them are old. On the summit of the Windyhill, the highest ground in the neighborhood of the town, an obelisk of freestone was placed some years ago, in memory of these same martyrs—two of whom, women, are said to have been drowned here. The authenticity of this event, though lately questioned by some, is doubted by very few in the locality where it is said to have happened. Pop. '91, 1445.

WIGWAM. This term is derived from the Algonquin or Massachusetts, *wēk*, "his house" or "dwelling place," with affixes denoting possession or location; *wēkon-om-ut*, English contraction making it *weekwam*, or *wigwam*. An Indian cabin or hut. As built by the Indians, it was composed of bark or mats laid over a frame-work of branches of trees, fastened into the ground in a circular shape, so arranged as to converge at the top, leaving an aperture for the escape of smoke. Two low openings were left on opposite sides, for entrance and egress, which were closed, at will, with bark or mats, according to the direction of the wind. When the Columbian order, a political society which was organized in 1789, was incorporated in 1805 under the title of the Tammany Society, thus adopting the name of an obscure Indian chief, their place of meeting was also christened, to meet the exigencies of the period, which delighted in ceremonies, parades, and trappings in Indian style, and the "great wigwam" of the "Tammany sachems" passed into history. In 1812 the Society built its first hall on the site of "The Sun" building, and it was rebuilt in 1860. In 1867 it removed to the "wigwam," now in use in East Fourteenth St. See TAMMANY SOCIETY.

WIKANA, the *Wacaka des Indes* of the French, a dietetic preparation of cacao much used in France for invalids. It consists of roasted cacao nibs and sugar, in the proportion of three parts of the latter to one of the former, well mixed together, and flavored with cinnamon, vanilla, ambergris, and musk.

WILBARGER, a co. in n. Texas, on Red river; 940 sq. m.; pop. '90, 7092. Co. seat, Vernon.

WILBERFORCE, SAMUEL, D.D., 1805–73; b. England; educated at Oxford; ordained 1828, and appointed curate of Chickendon; rector of Brightstone, isle of Wight, 1830; select preacher before the university of Oxford, 1837; archdeacon of Surrey, rector of Alverstoke, and chaplain to prince Albert, 1839; canon of Winchester cathedral, 1840; Bampton lecturer, 1841; sub-almoner to the queen, 1844; dean of Westminster, 1845; bishop of Oxford the same year, and chancellor of the order of the garter; lord high almoner of the queen, 1847. He was a high churchman, but opposed ritualism. He was one of the ablest debaters in the house of lords. He published *Sermons at Oxford; Eucharistica; Note-Book of a Country Clergyman; Rocky Island and other Parables; Agathos and other Stories; History of the American Episcopal Church.*

WILBERFORCE, WILLIAM, was b. at Hull, Aug. 24, 1759. His father was a wealthy merchant, descended from an old family, proprietors of Wilberfoss, in the e. riding of York. Wilberforce, at the age of 9, on his father's death, was sent to school at Wimbledon, where, under the care of a pious aunt, he ran the risk of becoming a Methodist. But his mother did not approve of a serious education, and removed him to a Yorkshire school, where the religious impressions he had received were soon dissipated by a life of gayety. His constitution was delicate, but he was quick and spirited, and fond of society, in which his lively conversation and musical talent made him a great favorite. While at school, he addressed a letter to a York paper "in condemnation of the odious traffic in human flesh," a subject he seems never afterward to have lost sight of. At 17 he entered St. John's college, Cambridge, and in due time he passed his examinations with credit. He came, on attaining his majority, into possession of a large fortune, and determined to enter parliament. In 1780 he was returned for Hull. He had known Mr. Pitt when at Cambridge, and in London they became inseparable friends. Wilberforce, in parliament, however, remained independent of party. The elevation of Mr. Pitt to the premiership gave him an opportunity of taking office, but he declined to do so. He rendered, however, efficient service to his friend. In Mar., 1784, on the eve of a dissolution, he spoke at a county meeting in York, called to vote an address against the coalition ministry; and such was the effect of his eloquence, that when he had concluded, a

resolution had been come to by the freeholders that he should be asked to stand for the county. He did so; and in spite of opposition from the great whig families, he was returned without a contest. Wilberforce's success in the leading county set an example to other constituencies, which was of very great advantage to the Pitt ministry. In the same year, Wilberforce made a tour on the continent with some ladies of his family and Isaac Milner, the dean of Carlisle, during which the serious impressions of his youth seem to have been revived. In 1787 he in a great measure eschewed gayety, and founded an association for the discouragement of vice; and in the following year, while in very bad health, he entered on his great struggle for the abolition of the slave-trade, to which he thenceforward dedicated his whole time. He was powerfully supported by the Quakers, and by Mr. Thomas Clarkson, who kept alive interest in the subject beyond the walls of the house of commons. In 1789 he first proposed the abolition of the slave-trade in the house of commons, and met, as he expected, with powerful opposition. In 1804 his bill was first carried through the commons; it was thrown out in the lords; and in the following year it was again lost in the commons. In 1806, however, a resolution was moved by Mr. Fox, pledging the commons to a total abolition of the slave-trade in the following session. It was adopted by the lords. Just before the discussion began in Jan., 1804, a work had been published by Wilberforce against the slave-trade, which had a marked influence on public opinion and the subsequent debates. The bill was passed by the lords. In the commons it was carried by an enthusiastic majority. Sir Samuel Romilly, who supported the measure, compared the feelings of Napoleon, then at the height of his glory, with those of the English philanthropist, "who would that day lay his head upon his pillow, and remember that the slave-trade was no more;" and the whole house burst into applause, and greeted Wilberforce with enthusiastic cheers. Wilberforce now sought to secure the abolition of the slave-trade abroad. He at the same time entered on an agitation for the total abolition of slavery itself. Declining health, however, compelled him in 1825 to retire from parliament, in which, since 1812, he had sat for the borough of Bramber. The movement against slavery was then intrusted to sir T. Fowell Buxton. Three days before Wilberforce's death, news was brought him that the abolition bill had passed a second reading, and he thanked God he had lived to see his countrymen spend 20 millions sterling in such a cause. He died July 29, 1833, and was buried as a national benefactor in Westminster abbey. In 1797 Wilberforce married the daughter of Mr. J. Spooner, the banker of Birmingham, by whom he had a large family. Wilberforce is the author of a *Practical View of Christianity*, which, on its publication in 1797, met with great success. — See the *Life of Wilberforce*, by his sons, and *The Private Papers of William Wilberforce* (1897). His third son, Samuel (born 1805, died 1873), became Bishop of Oxford in 1845, and bishop of Winchester in 1869. He distinguished himself in parliament by his eloquence, and was author of a *History of the Episcopal Church in America*, *Agathos*, and *The Rocky Island*, allegories, sermons, etc. See *Life of Samuel W.* (3 vols., 1879–83).

WILBUR, Hervey Backus, b. Mass., 1820; graduated at Amherst college, 1838; studied medicine and engineering, and became a practicing physician at Barre, Mass. In 1848 he received several idiot pupils into his house, treating them after Seguin's method. In 1815 the N. Y. legislature established an experimental school for idiots at Albany, which in 1854 became fully organized as the state idiot asylum at Syracuse, and of which Dr. Wilbur long had charge. He d. 1883.

WILCOX, a co. in s.w. Alabama on the Alabama river; 940 sq. m.; pop. '90, 30,816. Co. seat, Camden.

WILCOX, a co. in central Georgia; 563 sq. m.; pop. '90, 7980, chiefly of American birth. Co. seat, Abbeville.

WILDBAD, a small t. of Würtemberg, in the Black Forest, romantically situated in a valley watered by the Enz, about 29 m. w. of Stuttgart. It is noted for its thermal springs and baths, the water of which ranges from 90° to 100° Fahr. in temperature. The baths consist of numerous basins formed round the springs as they gush from the rocks, and floored with sand for the comfort of the bathers. From the circumstance that these baths are natural, or *wild*, and not artificial, the town derives its name. The waters are nearly pure, the principal ingredient they contain being common salt. They are peculiarly beneficial for rheumatism, gout, stiffness of limbs, paralysis, etc., and for some skin diseases. The season lasts from May till September, and the number of visitors has steadily increased from 470 in 1830 to 9074 in 1895. Pop. '90, 3446.

WILD CAT. See Lynx; Cat; Felidæ.

WILD CHERRY, two trees and one shrub, belonging to the rose family (order *rosaceæ*), sub-order *amygdaleæ*, genus *prunus*, indigenous to North America. 1. *P. Pennsylvanica*, or wild red cherry, is a tree from 20 to 30 ft. high, common in rocky woods, particularly in the northern states, flowering in May. Leaves oblong-lanceolate, pointed, finely and sharply serrate, green and smooth on both sides; flowers in a cluster on long pedicels; fruit round, light-red, very small, with thin pulp; stone globular. 2. *P. serotina*, the wild black cherry, whose timber is so much prized for cabinet and other work, is a fine tree with gray, sometimes rather shaggy bark on the trunk, and reddish

limbs, often growing in the western states to 80 ft. in height and 2 ft. or more in diameter, but smaller in the Atlantic states; leaves lanceolate-oblong, taper-pointed, serrate, with incurved, short, and callous teeth, thick, shining above; flowers, which appear in June, and fruit, in long racemes; fruit purplish-black, about the size of a common pea, but often larger on rich alluvial soils; when very ripe and large, they are agreeable to the taste. In some of the older sections of New York it was many years ago planted in the fields and along the fences, where some of the trees are still growing, but few are now planted. *P. Virginiana* is the common choke-cherry, but the name has been erroneously applied in the dispensatories to the wild black cherry just described. It is a tall, rather slender shrub (sometimes it may be called a tree), from 8 to 15 ft. high, with grayish bark, leaves oval, oblong, or obovate, blunt-pointed, sharply serrate; racemes short and close; petals roundish; fruit red, turning to dark crimson, and very astringent until perfectly ripe, when it is not unpleasant, if large, and growing on good soil; flowers in May; grows along fences and river banks, especially northward.

WILD-FOWL, a popular term, synonymous with *water-fowl*, and generally applied to web-footed birds, but sometimes employed also to include herons, plovers, and other birds which frequent rivers, lakes, and sea-shores. The different kinds are noticed under their proper heads.— *Wild-fowling* is one of the most difficult, and yet one of the most interesting pursuits of the British sportsman. *Rock-fowling* (see FOWLING) is not included under this term. Wild-fowling is prosecuted in a great variety of ways. The wild-fowler seeks his game with a gun and dog, generally a retriever; or he uses a small boat, called a *punt*, adapted to the shallow waters in estuaries which wild-fowl frequent; or he proceeds a little further to sea, in a boat with sails; sometimes he employs a yacht, or he endeavors to approach his game on land by the aid of a *stalking-horse;* or he has recourse to decoys, and other contrivances, by which great numbers of wild-fowl are captured. It is chiefly on the eastern and south-eastern coasts of England that wild-fowl abound in Britain, and they are most abundant in severe winters, coming as migratory birds from the north; but the draining of the fen-lands has greatly reduced their numbers. The ancient Greeks and Romans captured wild-fowl by various kinds of nets, one of which, called the *argumentum*, was not unlike the modern decoy-pipe, the birds, however, being generally driven, and not enticed into it. The *panthera* was a large purse or drag-net, placed along the banks of rivers. The ancient wild-fowlers sometimes practiced a system of decoying, apparently less perfect than the modern system, but essentially of the same nature, enticing the birds to their snares by movements intended to excite their curiosity, and for this purpose the fowlers clothed themselves in feathered jerkens, and danced with peculiar motions and gestures. Nooses and bird-lime were also much employed in ancient times. The Egyptians made much use of the *throw-stick*, a missile similar to the boomerang of the Australians, and which was dexterously thrown so as to hit the neck of the bird. In more recent times, falconry was much practiced for the capture of wild-fowl. The gun, decoys, and flight-ponds are now chiefly in use. Although many wild-fowl are killed with the ordinary fowling-piece, it is not thus that the greatest numbers are obtained. Much larger guns are used in punts and yachts, by which many are killed at one shot. The *stalking-horse* is still used in some parts of England, in order to enable the wild-fowler, armed with an ordinary fowling-piece, to get within reach of the birds, whilst they are feeding on the level swampy ground which they chiefly frequent. A horse well trained for the purpose, advances toward them, the fowler concealing himself on the side of it furthest from them. An ox is sometimes trained for this use, and indeed the kind of animal with which the birds are most familiar in the locality is most suitable. Artificial stalking-horses are sometimes employed, made of canvas, and stuffed with straw, the head being down, as if grazing. This practice is common in some parts of France. The use of the stalking horse is very ancient. Wild-fowl shooting is not unattended with danger. In pursuit of wounded birds on the ooze, the sportsman or fowler must use *splashers*, thin boards about 18 in. square, attached to the feet, to prevent him from sinking; and if he fall, it is very difficult for him to regain his feet. He cannot raise himself by resting his hands on the mud, which only makes him sink deeper and deeper, nor can he do it by getting upon his knees. The only method is to roll over on the back, drawing the arms out of the mud, and placing one foot with his splasher firmly on the ooze, to press both hands on the knee of the leg so raised, and give a vigorous spring. The punter is also in great danger of losing himself in foggy weather when pursuing wounded birds, and being unable to get back to his punt, when a fearful death awaits him on the return of the tide.

The curly-coated retriever is the best dog for the wild-fowl shooter, but good training is necessary to fit the dog for his use. The punter ought not to carry a dog with him, because the dog, having no opportunity of exercise after his return from the water, soon suffers from the cold of the winter weather in which the sport is pursued.

Sledging for wild-fowl is practiced by professional wild-fowl shooters on some parts of the English coast, particularly that of Hampshire. The sledger traverses the oozes by means of a small light sledge called a *launching-punt*, with a gun in the fore-part. He pushes it ahead, crawling on his knees, and often at full length on the mud, till he gets within range His most severe work is on sands and dry ground.

The *gunning-punt* is a small generally flat-bottomed boat, about 17 ft. in length, with a gun placed in the front of it, generally carrying about half a pound of shot at a charge. The punt must be nicely trimmed, so that the gun is nearly on a level with the surface of the water; and the fowler, having approached the birds where they are congregated, often kills great numbers by its discharge. The sport is pursued both by day and by night. The punt is generally constructed to carry only one person, and although he rows it in the ordinary manner till he discovers the birds, he is obliged then to lie down in the punt, and force it forward by a pole or by the oars with no little exertion, till he gets within range. The danger is not inconsiderable of his mistaking another punt in the darkness of night for an assemblage of wild-fowl, and firing at his fellow-sportsman. In a clear moonlight night, he proceeds if possible, against the light, so that he may see, and not be seen. By a successful shot, great numbers of water-fowl are often killed. The punt-gun is capable of being *tipped*, that is, elevated so as to shoot water-fowl on the wing; and the most successful shots are often made by waiting till they rise, and tipping the gun. The punter cannot expect to recover all his wounded birds, and there are men on some parts of the coast who make their living during winter mostly by seeking for them in the morning.—The *sailing-punt* is a mere modification of the ordinary gunning-punt; the sail saving much hard work to the fowler, but its use is attended with great danger, and it is utterly unsuitable for rough water. A *shooting-boat* is therefore sometimes used; but in it the gun cannot be fixed level with the surface of the water, as in the punt, and still more is this the case with the *shooting-yacht*. The practice of the sportsman is therefore considerably different, and the best shots are generally made after the birds are on the wing. The helmsman of the shooting-yacht must be quick and skillful in luffing up, in such a manner as to cross the flight of the birds, that they may be well exposed to the gun, which is generally larger than the punt-gun. Great numbers of wild-geese, swans, etc., are often killed from the shooting-yacht. In approaching the birds, the greatest caution is necessary, and the men in the yacht must be carefully concealed behind the bulwarks.

Notwithstanding the draining of fen-lands, many of the decoys of the eastern coast of England are still very valuable, and in some instances they afford a considerable part of the living of the parochial clergy. A good decoy-pond attached to a rectory adds not a little to its value. It is in severe winters that the decoy-pond is most productive. It must be in a secluded situation, and the proprietor takes care to keep it as secluded as possible, permitting no use of the gun or rifle in its neighborhood. An extent of three or four acres is about the best for a decoy-pond. Very large ones are found to be comparatively much less productive. The decoy-pond ought to be surrounded with trees and copse, reeds and sedges being permitted to flourish near the water. Several *pipes* are led off from the pond, in different directions, ditches of 6 or 8 in. in depth, of a curved form, and becoming narrower toward the extremity. It is in these pipes that the wild-fowl are caught, particularly mallards, teal, and widgeons, and often in very great numbers. The length of the pipe is generally from 60 to 80 yds., its breadth at the mouth from 20 to 30 ft., diminishing to 2 ft at the extremity, where it terminates in a tunnel-net, generally carried out on the dry land. The whole pipe is spanned with a light netting, spread upon semicircular bars of iron rod, in an arch of about 12 ft. above the water at the entrance, but becoming lower as the pipe becomes more narrow. To attract wild-fowl to the pond, and to induce them to enter the pipe, *decoy-ducks* are kept, constant inhabitants of the pond, and regularly fed. Wild-fowl come more readily to the pond because of their presence, and follow them also to the mouth of the pipe, and into it, when they come at the well-known whistle of the decoy-man, to feed on the grain which he scatters for them on the water. It is only thus that the decoy-ducks are of use. They are not trained in any way, nor do they display any intelligence beyond response to the whistle which invites them to their food. Very different is the case with the decoyer's dog, the *piper*, so called not from any vocal powers, but from his use in enticing birds into the pipe. The dogs best adapted for this purpose are of a peculiar breed, small, fox-like, and very lively and frolicsome. They are very carefully trained, and their peculiar qualities seem to be in some measure hereditary. On the convex side of the curve of the pipe, for about 30 or 40 yds., instead of netting coming down to the ground, screens made of reeds are placed of height sufficient to conceal the decoyer; but they are placed obliquely, with narrow outlets between them, through which his dog may pass, and with bars in the intervals about 18 in. high, for the dog to leap over. When the wild-fowl have been attracted to the mouth of the decoy, and the decoyer, peeping through the screens, perceives that they are in the proper situation, he sends out the dog, which makes sportive gambols in their sight, and they are attracted by the strange object, as sheep are when a small dog plays about in the field where they graze. They enter the pipe in pursuit, as if for gratification of their curiosity, and the dog leaps over the first leaping-bar, and disappears behind the screens, where his master immediately rewards him with a piece of cheese or other delicacy. When the wild-fowl have advanced a little further, the dog is sent out again, repeats his gambols, leaps over the second leaping-bar, and gets a second piece of cheese. The curiosity of the birds seems to increase, and when they have proceeded far enough the man shows himself, whereupon a rush is made by the birds toward the far end, where they are captured. The dog is trained to keep perfect silence. A single bark would disperse the birds. The success of the decoyer depends very much on the

state of the weather, and he must consider the direction of the wind in order to the choice of the pipe he is to use. Into such details, however, we cannot enter. It is in the daytime, and not by night, that wild-fowl are captured in the decoy. They generally leave the decoy-pond at night for neighboring feeding-grounds. The decoyer often finds it profitable not to attempt the capture of birds when they first appear on the pond, but to wait for a few days, when they congregate in greater numbers.

Decoys are of so great value that many acts of parliament have been passed for their regulation and protection. A decoy which has been established for twenty years enjoys certain privileges secured by law, particularly as to the quietude of its vicinity, which must not be disturbed by the firing of guns at wild-fowl apparently going to the pond, even by the proprietors of land over which they pass.

Flight-ponds alone remain to be noticed. These are used chiefly for the capture of pochards or dunbirds, which very seldom enter the pipes of the decoyer. The same pond is sometimes used both as a decoy-pond and a flight-pond. The pochard, having its legs placed far back, cannot rise from the water so suddenly as the wild-duck or widgeon, and skims the surface for many yards, proceeding by a very gradual ascent. To capture flights of pochards, nets are used, which are fixed to a cumbrous apparatus of poles at the side of the pond. The pond may be about 70 or 80 yds. square.

Folkard, in his excellent work upon wild-fowling, remarks that writers upon sporting literature generally apply correct terms to game and birds of the land, while water-fowl are invariably classed by them as "flocks." The modern terms, as applied to water-fowl, are, according to Folkard, as follows: "A herd of swans. A gaggle of geese (when on the water). A skein of geese (when on wing). A paddling of ducks (when on the water). A team of wild-ducks (when flying in the air). A sord or suit of mallards. A company of widgeon. A flight or rush of dunbirds. A spring of teal. A dopping of sheldrakes. A covert of coots. A herd of curlews. A sedge of herons. A wing or congregation of plovers. A desert of lapwings. A walk of snipes. A fling of oxbirds. A hill of ruffs. A small number of wild-fowl, as ducks and geese (about 30 or 40), is termed a 'trip.' The same of widgeon, dunbirds, or teal, is termed a 'bunch;' and a smaller number (from 10 to 20) is called a 'little knob.' Of swans, it would be said, a 'small herd;' and sometimes of geese, a 'little gaggle,' or a 'small skein;' and so of ducks, a 'short' or 'long team.'"

WILD HUNT (Ger. *wilde* or *wüthende jagd;* also *wildes* or *wüthendes heer*, wild or maddening host; *nachtjäger*, night huntsman, etc.), the name given by the German people to a fancied noise sometimes heard in the air at night, as of a host of spirits rushing along over woods, fields, and villages, accompanied by the shouting of huntsmen and the baying of dogs. The stories of the wild huntsman are numerous and widespread: although varying in detail, they are uniform in the essential traits, and betray numerous connections with the myths of the ancient gods and heroes. The root of the whole notion is most easily discernible in the expression still used by the peasants of lower Germany when they hear a howling in the air, "wode hunts" (*Wode jaget*), that is, Wodan or Odin marches, as of old, at the head of his battle-maidens, the Walkyries, and of the heroes of Walhalla; perhaps, too, accompanied by his wolves, which, according to the myth, along with his ravens, followed him, taking delight in strife, and pouncing upon the bodies of the fallen. The heathen gods were not entirely dislodged from the imagination of the people by Christianity, but they were banished from all friendly communication with men, and were degraded to ghosts and devils. Yet some of the divine features are still distinctly recognizable. As the celestial god Wodan, the lord of all atmospheric and weather phenomena, and consequently of storms, was conceived as mounted on horseback, clad with a broad-rimmed hat shading the face, and a wide dark cloak; the wild huntsman also appears on horseback, in hat and cloak, and is accompanied by a train of spirits, though of a different stamp—by the ghosts of drunkards, suicides, and other malefactors, who are often without heads, or otherwise shockingly mutilated. One constant trait of the stories shows how effectually the church had succeeded in giving a hellish character to this ghost of Wodan—when he comes to a *cross* road, he falls, and gets up on the other side. On very rare occasions, the wild huntsman shows kindness to the wanderer whom he meets; but generally he brings hurt or destruction, especially to any one rash enough to address him, or join in the hunting-cry, which there are many narratives of persons in their cups having done. Whoever remains standing in the middle of the highway, or steps aside into a tilled field, or throws himself in silence on the earth, escapes the danger. In many districts, heroes of the older or of the more modern legends take the place of Odin; thus, in Lusatia and Orlagau, Berndietrich, that is, Dietrich of Bern; in lower Hesse, Charles the Great; in England, King Arthur; in Denmark, King Waldemar. The legend has also in recent times attached itself to individual sportsmen, who, as a punishment for their immoderate addiction to sport, or for the cruelty they were guilty of in pursuing it, or for hunting on Sunday, were believed to have been condemned henceforth to follow the chase by night. In lower Germany, there are many such stories current of one Hakkelberend, whose tomb even is shown in several places. Still, the very name leads back to the myth of Wodan, for Hakkelberend means literally the mantle-bearer (from O. H. Ger. *hakkul;* O. Norse, *hökull* or *hekla;* Ang.-Sax. *haccle*, drapery, mantle, armor; and *bern*, to bear).

The appearing of the wild hunter is not fixed to any particular season, but it occurs frequently and most regularly in the twelve days between Christmas and Epiphany.

Another version of the wild hunt is to be found in the legend prevalent in Thuringia and the district of Mansfeld. There the procession, formed partly of children who had died unbaptized, and headed by Frau Holle or Holda (see BERCHTA), passed yearly through the country on holy Thursday, and the assembled people waited its arrival, as if a mighty king were approaching. An old man, with white hair, the faithful Eckhart (see TANNHÄUSER and VENUSBERG), preceded the spirit-host, to warn the people out of the way, and even ordered some to go home, so that they might not come to hurt. This is the benign goddess, the wife of Wodan, who, appearing under various names, travels about through the country during the sacred time of the year. This host of Holda or Berchta also prefers the season about Epiphany. In one form or other, the legend of the wild hunt is spread over all German countries, and is found even in France and Spain.

WILDE, OSCAR FINGALL O'FLAHERTIE WILLS, b. Ireland, 1856; son of Sir William, a well-known oculist, and Lady Wilde. He graduated at Magdalen coll., Oxford, 1878, winning the Newdigate prize for English verse. He devoted himself to poetry and to æsthetic culture, upon which topic he has delivered many lectures, and has been styled the apostle of æstheticism. He has been satirized under the guise of Postlethwaite by Du Maurier, and is the original of Gilbert's "Bunthorne" in the comic opera of *Patience*. A vol. of his poems was published, 1880. A tragedy, *Guido Ferranti* in 1890, and *Intentions* (essays) in 1891. He delivered a series of lectures in the U. S., 1882–83. In 1893–95 he won considerable success as a writer of epigrammatic comedies,—*Salome*, *Lady Windermere's Fan*, and *The Importance of Being Earnest;* but in the latter year, being convicted of unnatural practices, he was sentenced to prison at hard labor. He remained in prison till 1897.

WILDE, RICHARD HENRY, 1789–1847; b. Dublin, Ireland; came to this country in 1797; studied law; was admitted to the bar, 1809, and rapidly rose in his profession; became attorney-general of Georgia, and was a member of congress, 1815–17, 1824–25, and 1827–35. He was a poet of some merit, and in his stay in Europe, 1835–40, made interesting documentary discoveries in regard to Dante, and found an original painting of the poet. He wrote *The Love, Madness, and Imprisonment of Tasso* (1842) and *Hesperia*. His poem, *My Life is like a Summer Rose*, was praised by Byron. From 1843 to his death he was professor of law in the Louisiana university.

WILDEBEEST. See GNU.

WILDEN. See POLITICAL PARTIES, GERMAN.

WILDER, BURT GREEN, M.D.; b. Boston, 1841; graduated in the scientific dept. of Harvard univ., 1862, and in the med. dept., 1866; elected prof. of physiology at Bowdoin coll., 1874, having been previously appointed prof. of physiology, comparative anatomy, and zoology at Cornell. His works include *Researches and Experiments on Spider's Silk*, 1866; *What Young People should Know; Anatomy, Physiology, and Hygiene of the Human Reproductive Organs*, 1875; *Emergencies; how to avoid them and how to meet them*, 1879; *Health Notes for Students, new ed.*, 1883; *Introduction: Guide to Practical Works in Elementary Anatomy, based upon the Cat, Frog, and Menobranchus*, 1881. He wrote, in conjunction with Prof. Gage, *Anatomical Technology as applied to the Cat, etc.*, 1882. He was, 1885, pres. of the American Neurological assoc.

WILDER, MARSHALL PINCKNEY, b. N. H., 1798; became a merchant in Boston in 1825. He was a member of both houses of the Massachusetts legislature, became president of the senate in 1850, and was also a member of the executive council. He did much for the progress of agriculture and of horticulture; was active in establishing the state agricultural college, and the state board of agriculture. D. 1886.

WILDERNESS, BATTLES OF THE. The name given to a series of engagements which took place in Virginia, between the federal and the confederate forces, in 1864. The "Wilderness" is an extensive tract of table-land stretching southward from the s. bank of the Rapidan, seamed with ravines, and, excepting a few small clearings, covered with a dense growth of dwarf timber and underbrush. At the period of the opening of the campaign of 1864, of the army of the Potomac, the confederate army, under Gen. Lee, occupied the bluff ridges which skirt the s. bank of the Rapidan. This was a position made strong by nature; and which had been so strengthened by works, that a direct attack upon it would have proved fruitless; and he could only be drawn from it by a turning movement. It would have been more easy to have flanked Lee's left; but that movement would have separated Grant too far from his base of supplies, and Grant concluded to cross the Rapidan by its lower ford, and turn Lee's right. The plan of Gen. Grant was, in fact, to gain the rear of the confederate army, and he had given the instructions necessary to the fulfillment of this purpose to his corps commanders. But instead of retreating out of the region which bears that name, Lee fought the battles of the Wilderness.—The army of the Potomac, under the immediate command of Gen. Meade, broke camp on May 3d, 1864, and crossed the Rapidan by the various fords, the second corps under Gen. Hancock having the left, and bivouacking at Chancellorsville. One hundred thousand men, with the enormous train of 4,000 wagons, were per-

mitted by Lee to cross the river unmolested; doubtless with the design that this vast mass of men and impediments should become entangled in the wilderness, and be destroyed or captured. On the morning of the 5th the confederates attacked the right of the union advance, and later in the day the left became heavily engaged behind breastworks hastily thrown up, and such natural defenses as the character of the country offered. This day's fight was marked by the loss of Brig.Gen. Alexander Hays, a chivalrous and intrepid union soldier and leader. The fight on the 5th was mainly with A. P. Hill's corps, and on the 6th Longstreet came into action with a heavy force, against which were brought the 2nd and a part of the 9th corps, supported by Sheridan's cavalry, which sharply attacked the enemy. While the right of the union line was being severely pressed by the confederates, Longstreet attacked the left in force, and drove it back with heavy loss, being finally supported by re-enforcements commanded by Lee in person, when the union breastworks were captured, though they were afterward retaken. After the fight at Chancellorsville; which resulted in its defeat with very heavy loss, the federal army retreated along what was known as the Brock road. In this, the last battle of the wilderness, ten thousand men were killed and wounded, on both sides; the union loss being the greater, particularly in officers. It had been Gen. Grant's design, in crossing the Rapidan, to turn Lee's flank, and get between him and Richmond. This intention was temporarily defeated by the stern resistance offered in the wilderness; but with the dogged tenacity which characterized him, Grant returned to it immediately after the fight, ordering his columns forward toward Spottsylvania court-house, in which movement Lee immediately followed him, marching his army by roads nearly parallel with that followed by the union forces. There was no fighting on the 7th, and the union army pushed forward on that date with the 5th corps in the advance, with orders to seize Spottsylvania court-house. In this, however, the confederates anticipated them, and when the 5th corps (Gen. Warren) reached the open plain near the court-house, it was met by a murderous fire on the part of Longstreet's corps, which had already reached this point. This was on the 8th, late in the afternoon, and the union army formed under fire, the 5th corps being supported by the 2d (Hancock's), with a brigade of heavy artillery massed in rear of the line of battle, but which was afterward withdrawn by orders from headquarters. On the 9th there was constant firing by confederate sharpshooters, and now fell Gen. Sedgwick, the brave commander of the 6th corps, who was shot in the face, while rallying his men. There was no heavy fighting on the 9th, but on the 10th there was a general attack all along the line, and the union army suffered greatly and was forced to retire. On the 12th the series of disasters was in a measure retrieved; the celebrated "Stonewall" confederate brigade being captured almost in its entirety, including 4,000 prisoners, 20 pieces of artillery, with horses, caissons, and material complete, several thousand stand of small arms, and more than 30 battle-flags: among the prisoners were Maj.Gen. Edward Johnson and Brig.Gen. George Stuart. It was in this day's fight that Maj.Gen. Lee, seeing the battle going against him, attempted to lead a charge of Early's men in person, and was only restrained from periling his own safety through the earnest remonstrances of his officers, and loud cries from the men of "Gen. Lee to the rear!" The battle was not renewed until the 18th, and on the 19th a movement was made to the North Anna, and thence to Cold Harbor and the Chickahominy. A running fight was kept up until June 12th, when Grant made his change of base to the James river, making a march of 55 m. across the peninsula, to a point just below Harrison's landing; Lee's army not interfering with the withdrawal of the union forces from their ill-starred campaign in the wilderness. The two armies during this campaign of 43 days, numbering each about 100,000 men, lost about equally. The design of Gen. Grant, however, was foiled by the shrewd maneuvering of Lee, and the fierce fighting of the confederate solders. Gen. Hancock, after the wilderness, when asked where the second corps was, answered that "it lay buried between the Rapidan and the James." This was hardly an exaggeration, as that corps alone lost 9,762 men between May 4 and 27. This corps suffered more in proportion than the others, but the entire campaign was a period of frightful slaughter on both sides; and this, though the union advance reached a point within 15 m. of Richmond, without any strategic or other military success to balance it.

WILDEY, Thomas, 1783–1861, b. England; emigrated to America in 1817, settled in Baltimore, and engaged in the trade of coach-spring making. He was the founder of the American order of odd fellows. The members of the organization in Baltimore erected a monument to him.

WILEY, Isaac William, d.d., 1825–84; b. Penn.: studied medicine and afterward theology, joining the Methodist Episcopal conference in 1849; missionary to China, 1850–54. After his return was a pastor, 1854–58; principal of the seminary at Pennington, N. J., 1858–64; editor of the *Ladies' Repository,* published at Cincinnati, by the Methodist church, 1864–72; elected bishop 1872, and resided at Cincinnati, Ohio. He published *Fallen Heroes in Foo-Chow,* and *Religion in the Family.*

WILEY, John, b. Long Island, N. Y., 1808; was a clerk in his father's book-store in New York from the age of thirteen for three years; then a clerk in a wholesale dry goods store; was associated in the book-business at one period with A. T. Goodrich, subsequently with George Long; was a partner with George P. Putnam, 1838–48, the firm being engaged chiefly in importing foreign publications, and subsequently conducted the business in connection with his sons. He died in 1891.

WILFRID, Saint, an Anglo-Saxon bishop, was born, of noble parents, in the kingdom of Bernicia in 634. He was remarkable when a boy for his good looks, graceful manners, and ability. He became at 14 the attendant on a Saxon nobleman, who had retired to spend the last years of his life in the monastery of Lindisfarne. There his attention was directed to the controversy as to the time of celebrating easter (q.v.) existing between the two sections into which the Anglo-Saxon Christians were divided; the one advocating the Roman practice, which was that of the continental churches generally, the other adhering to the Scoto-British. Wilfrid resolved to visit Rome to ascertain which was in the right, and thither he went at the age of 19, with recommendations from the courts of Kent and Bernicia. He returned to England a warm partisan of the Roman party. From Alfrid, king of Northumbria, he received a grant of land and a monastery at Ripon, and there, in 664, he was ordained a priest. The synod of Whitby, which met in 664 to discuss the disputed questions between the two parties in the church, was attended by the most distinguished members of both, and among others, by Colman, bishop of Lindisfarne, and Wilfrid. We have a curious acccount of this conference. The king presided, and seems at first to have been puzzled by the arguments, but he noticed that Colman always referred to St. Columba, Wilfrid to St. Peter—and it struck him that the relative power of these saints had a close connection with the points at issue. "St. Peter," says Wilfrid, "is the rock on which the Lord founded his church, and to him he intrusted the keys of heaven." "Did St. Columba not receive the same power?" asked the king. Colman could not say he had. "Then you both admit that God has given the keys to St. Peter?" Both said they did. "Well," continued the king, "if it is so, I shall not oppose him. Were I to do otherwise, I might find no one to open the gate when I came there; St. Peter might turn his back on me. We must not offend him." The council and audience were carried away by this argument, and the king decided in favor of the Roman party. Wilfrid was afterward named bishop of York, but he did not enter into possession of his see until 669. He then surrounded himself with great pomp, built churches, one of which, at Hexham, was said to be the finest north of the Alps, and strove to oppose the ecclesiastical to the royal power. A quarrel followed with the new king of Northumbria, named Egfrid, and Wilfrid was deposed. He started on a journey to Rome, to make a personal appeal to the pope; but he was driven by a storm to the Coast of Friesland, the inhabitants of which were still pagan. There, however, he was hospitably received by the king. To his arrival the people attributed an excellent fishing season and abundant harvest. He was asked to preach, and he did so in his own Anglo-Saxon tongue, which was perfectly intelligible to the Frisians. Such was the effect, that he baptized many thousands of the people, and all the princes. The event is one of the most memorable in the history of northern Germany and Scandinavia, for with it began the conversion of these countries to Christianity by Anglo-Saxon missionaries, and the introduction into them of the arts and knowledge inherited from ancient civilization (see Boniface; Willibrod). Wilfrid reached Rome, and the pope decided in his favor; but on his return to England, the king gave no heed to the decree, and committed him to prison. He escaped, however, to the Weald of Sussex, where he converted the pagan inhabitants. He was afterward recalled to his see; and a proposal was made to elevate him to the primacy, but he was still opposed, as the leader of the Roman party, and ultimately he was deposed and excommunicated. He again went to Rome, remained there some years, returned to England in 705, and died at Oundle, in Northampton, in 709.

WILHELMJ, August, b. Usingen, Germany, 1845; son of August, formerly atty. gen. of Prussia. He studied music under Conrad Fischer, and made his first appearance as a violinist at Limburgh, 1854. He went to Weimar, 1861, and there met Liszt, who procured his admission to the Leipsic conservatory, where he studied for three years. He has since traveled throughout Europe, Asia, and America. In 1894 he became professor in the Guildhall academy in London.

WILHELMSHAVEN, the chief naval port of Germany, is on the w. side of the entrance of the bay or gulf of Jade, about 45 m. n.w. of Bremen. The town, first projected in 1856, has been regularly laid out on a strip of ground bought by Prussia from Oldenburg in 1864. It is now a fortress of the first rank, defended by outlying forts and an elaborate system of torpedoes; and with its moles, extensive basins, dry docks, vast stores for the navy, and workshops for all the requirements of a fleet, has been a very costly creation. A harbor for commercial purposes has been made to the s. of and connected with the naval one; but the mercantile importance of Wilhelmshaven is yet in the future. The population, '90, was 15,471. See Jade.

WILHELMSHÖHE. See Cassel.

WILKES, a co. in n.e. Georgia, having the Broad river for its n. boundary, the Little river on the s.; 464 sq. m.; pop. '90, 18,081. Co. seat, Washington.

WILKES, a co. in n.w. North Carolina, having the Blue ridge on the n. border, drained by the Yadkin; 680 sq. m.; pop. '90, 22,675. Co. seat, Wilkesboro.

WILKES, Charles, American naval officer and explorer, was b. in New York in 1798, and entered the navy in 1818, becoming lieut. in 1826. In 1838 he was made commander of an exploring expedition, by which the Samoan and Fiji islands were carefully surveyed, and many other regions of the southern seas examined. In 1842 he

published a *Narrative* of the expedition (5 vols. 1845), for which he received the gold medal of the Royal geographical society. In 1849 he published a volume on *Western America;* and in 1856, on the *Theory of the Winds.* As commander of the U. S. steamer *San Jacinto,* he in 1861 forcibly removed from the British mail-steamer *Trent,* Messrs. Mason and Slidell, commissioners of the confederate states to England and France, and conveyed them to Boston, receiving the thanks of congress, and the acclamations of the people; but, at the demand of the British government, his act was disapproved, and the commissioners restored. In 1862 he was promoted to the rank of commodore, and in 1863 commanded a squadron in the West Indies. In 1866 he was commissioned as rear admiral on the retired list. He died Feb. 8, 1877.

WILKES, GEORGE, b. 1820; d. 1891; in 1858 became co-editor with William T. Porter of the *Spirit of the Times,* a sporting and dramatic paper published in New York, of which he is now proprietor. He published a *History of California* (1845); *Europe in a Hurry* (1852); and a series of Shakespearean papers which appeared in his journal have been republished in book form. In 1870 he received the grand cross of Stanislas from the emperor of Russia for suggesting a railroad to China and India, *via* Russia. D. 1885.

WILKES, JOHN, a celebrated public character, was b. in London, Oct. 17, 1727. His father, a brewer or distiller at Clerkenwell, sent him when a lad to the university of Leyden, where he received an excellent education. On his return to England in 1749 he married a Miss Mead, an heiress, ten years his senior. His good manners, learning, ready wit, and open table secured him many friends, but extravagance and dissipation soon involved him in difficulties. He and his wife separated, and in a lawsuit which followed, facts came out most damaging to his character. He was nevertheless named high sheriff of Buckinghamshire, and in 1757 returned to parliament as member for Aylesbury. In the house he joined in the popular clamor against lord Bute; and in June, 1762, founded a paper entitled the *North Briton,* in which he denounced him with such vigor and success as to drive him from the ministry. He attacked with equal bitterness the next ministry, insinuating that although Mr. Greville was nominally at the head of affairs, lord Bute still had the ear of the king. In the 45th number of the *North Briton,* he charged the king with having uttered a falsehood from the throne, and in consequence, his house was entered, and his papers were seized. He was himself committed to the Tower, on a general warrant. But he was released by Chief-Justice Pratt, on account of his privilege as a member of parliament. His paper was burned by order of the house of commons; but a riot ensued, showing that public sympathy went with Wilkes. A prosecution was next instituted against the under-secretary of state by Wilkes for the illegal seizure of his papers; and he obtained £1000 damages—a declaration being at the same time made by the chief-justice that general warrants are illegal. Wilkes then went to France, on the plea of bad health, and was expelled from the house of commons. In his absence he was convicted of having printed privately an obscene poem, of which he was one of the authors. It was hoped that evidence of his immoral character would disgust the public with him. But the copy of the book on which the prosecution had been founded had been obtained surreptitiously from a printer employed; and this fact becoming known, the steps taken by the government, instead of injuring Wilkes, only added to the outcry against ministers. On the formation of a new ministry under the duke of Grafton, Wilkes returned to England, and becoming a candidate for Middlesex, harangued great crowds in London. After his election he was arrested, in consequence of his outlawry; and on the way to prison he was rescued by a mob. He, however, after it had dispersed, voluntarily gave himself up to justice. When parliament met, a crowd assembled to convoy him to the house of commons. A riot took place, and the military were ordered to fire on the mob in St. George's Fields. Many persons were wounded, and one was killed. The coroner's jury who sat on the body returned a verdict of murder against the magistrate who had given the order to fire; and he was tried for that crime, but acquitted. Wilkes secured a copy of a letter from lord Weymouth to the chairman of the Lambeth quarter sessions in which it was recommended that the military should be employed to suppress disturbances in London. It was published with a preface by Wilkes, in which he charged the secretary of state with having planned "the massacre in St. George's Fields." The house declared the preface to contain a seditious libel, and Wilkes was again expelled. He was after this re-elected several times as member for Middlesex; but the elections were declared void. Col. Luttrell, who vacated his seat and opposed him, obtained only 300 votes; but he was declared to be duly elected, in defiance of a protest from the whole country. Wilkes, still in prison, was now recognized as the champion of public liberty, and became the most popular man in England. In 1769 he obtained a verdict against lord Halifax in the court of common pleas, with £4,000 damages. He was shorly after discharged from prison on giving a bond for good behavior during seven years. In 1774 he was chosen lord mayor of London, and again returned for Middlesex, which he continued to represent for many years. In 1782 the resolution by which he had been declared incapable of re-election was expunged from the minutes of the house of commons, as subversive of constitutional rights. The other resolutions relating to Wilkes were at the same time expunged. Two years later he withdrew from the house of commons. He died Dec. 27, 1797.

WILKES-BARRE, city and co. seat of Luzerne co., Pa.; on the Susquehanna river, and the Central of New Jersey, the Delaware and Hudson, the Delaware, Lackawanna, and Western, the Lehigh valley, the New York, Susquehanna, and Western, and the Pennsylvania railroads; 18 miles s.w. of Scranton. It is near the center of the famous Wyoming valley, and the beautiful scenery around it attracts many tourists and summer visitors. It contains a high school, Hillman academy, female institute, Mollinckrodt convent school, city hospital, Osterhaut free library, Y. M. C. A. building, public park along the river bank, electric, gas, and naphtha light plants, electric street railroad system, water-works supplied from Spring brook, about 20 public school buildings, nearly 50 churches, and national and state banks. The city was settled in 1769, incorporated as a borough in 1806, and chartered as a city in 1871. The U. S. census of 1890 reported for Wilkes-Barre, 270 manufacturing establishments, employing $5,598,139 capital and 4405 persons, paying $2,058,978 for wages and $4,026,579 for materials, and having a combined output valued at $7,746,371. The principal manufactories are foundries and machine shops, locomotive and car works, silk and lace mills, wire rope and axle works, flour and grist mills, and breweries. The distinctive industry of the city is coal-mining. Anthracite coal has been mined here since before the Revolutionary war, and the various mines yield an average annual output of 12,000,000 tons, and employ about 36,000 men and boys. The mammoth vein underlying the city and almost all of the Wyoming valley has an estimated average thickness of 56 feet. The city has a property valuation of over $40,000,000, assessed at about one-seventh of actual value; owns property valued at $250,000; and has a net debt of less than $400,000. Pop. '90, 37,718.

WILKIN, a co. in w. Minnesota, bounded by the Red and Bois de Sioux rivers, which separate it from N. Dakota; 725 sq.m.; pop. '90, 4346, chiefly of American birth. Co. seat, Breckenridge.

WILKIE, Sir DAVID, a distinguished Scottish painter, was b. in Fifeshire, at Cults, of which parish his father was minister, Nov. 18, 1785. His boyish passion for art was too strong to be resisted by his father, who, with much reluctance, sent him in 1799 to study in the academy of Edinburgh. Here he greatly distinguished himself; and returning home, in 1804, he painted his "Pitlessie Fair," a piece in which already his peculiar genius is pronounced, and which brought him the sum of £25. The price seems paltry; but for the work of an unknown country stripling in an original walk of art, it was perhaps to be considered handsome. Shortly after, Wilkie proceeded to London, intending to return to Scotland after a year or two of study; but the great success of his picture, "The Village Politicians," determined him to settle in the metropolis. Not that pecuniarily, he was very greatly benefited, £30 being all that the earl of Mansfield could with difficulty be got to pay for the picture, though aware that, on a point of honorable scruple, the artist had refused repeated offers of £100; but the originality and humor of the work greatly captivated the public, and at once established the reputation of the painter, who had soon commissions in plently, at greatly advanced prices. In 1809 his brethren of the Royal academy ratified the favorable verdict of the public by electing him an associate; and two years afterward he was advanced to the rank of academician. In 1814 in company with his friend Haydon, he visited Paris, and inspected with great delight the art-treasures at the Louvre. Though his father had died some years before, and his mother and sister were now living with him at Kensington, in 1817 he made a run into Scotland, and, while the guest of Scott at Abbotsford, painted his well-known picture of the great poet and his family. During these years, Wilkie had been engaged on the series of pictures on which mainly his fame rests; pictures familiar by engraving to every one (the "Blind Fiddler," "Card Players," "Rent Day," "Jew's Harp," "Village Festival," "Blind Man's Buff," "Distraining for Rent," "The Penny Wedding," "Reading of the Will," etc.), in which the homely humors of humble life are expressed by a vehicle appropriately simple, and—though scarce in the higher sense to be called color—of charming purity and transparency. In this style, distinctively his own, his genius is commonly held to have culminated in "The Chelsea Pensioners listening to the News of Waterloo," which was painted during the years 1820–21. This work was a commission from the duke of Wellington, who paid the artist 1200 guineas for it. Subsequently, he changed his style, sought to emulate the depth and richness of coloring of the old masters, and deserting the homely life, which he could treat so exquisitely, chose elevated, and even heroic subjects, to the height of which he could never rightly raise himself. The florid picture, painted in 1830, of "George IV. entering Holyrood," which, though not without its fine points, can delight no one but a flunkey, gave the first hint of the change; and no doubt a tour over nearly the whole continent, which he made for his health, in 1824, everywhere, of course, intent upon the grand old masterpieces, did something to stimulate the new and unwise ambition. By common consent it has been adjudged unwise; and Wilkie remains, and will remain, memorable, not for the quasi-high art of his later years, but for the simpler, truer, and, in every right sense, higher art of his earlier time. He never, however, ceased to be popular, and honors continued to be showered upon him. On the death of sir Henry Raeburn, he succeeded him as limner to his majesty; in 1830 he was made painter in ordinary to his majesty, in room of sir Thomas Lawrence deceased; and in 1836 the honor of knighthood was conferred upon him. Wilkie had never been robust; and his health now began to give way seriously. In 1840, seeking to re-establish it, he

once more left England; but he did not find what he sought. Having visited Syria, Palestine, and Egypt, he died on his voyage home, off Gibraltar.

WILKINS, a township in Allegheny co., Penn. Pop. 2304.

WILKINS, Sir CHARLES, D.C.L. 1749–1836; b. England; went to Calcutta in the service of the East India company, 1770; remained several years and acquired a thorough knowledge of Bengali, Arabic, Persian, and Sanskrit. He made type for printing Halhed's Bengali grammar, and matrices for the font of Persian type. He translated the *Bhagavat Gita* and *Hitopadesa*. Returning to England, 1786, he was appointed librarian of the East India company, 1801; was knighted 1823. He published a *Grammar of the Sanskrit Language; The Roots of the Sanskrit Language;* edited Richardson's *Arabic and Persian Dictionary*, 2 vols.

WILKINS, JOHN, D.D., 1614–72; b. England; graduated at Oxford, 1632; took orders 1635; was chaplain to lord Say and Charles, count palatine of the Rhine; during the civil war, adhered to the parliament; was made warden of Wadham college, 1648; married the sister of Oliver Cromwell; appointed by Richard Cromwell master of Trinity college, 1659, and ejected at the restoration, 1660; having obtained favor with Charles II., was made prebendary of York, 1660; rector of St. Lawrence, London, 1662; and bishop of Chester, 1668. Among his published writings were treatises on *The Moon a Habitable World; The Earth probably one of the Planets; The Gift of Preaching*, and *The Beauty of Providence*.

WILKINS, MARY E., American author, was born at Randolph, Mass., and still resides there. After writing verses and stories for children's magazines, she contributed to *Harper's Bazar*, a sketch entitled "Two Old Lovers," and by similar studies of character published in that journal and in *Harper's Magazine*, became known as a most graphic depictor of certain phases of New England country life. Her collected stories have appeared under the leading titles *A Humble Romance* (1887) and *A New England Nun* (1891), besides the novels, *Jane Field; Pembroke; Jerome, a Poor Man* (1897), and a tragedy, *Giles Corey, Yeoman*, founded upon incidents connected with the witchcraft trials at Salem.

WILKINSBURG, borough in Allegheny co., Pa; on the Susquehanna river and canal, and the Pennsylvania railroad; 7 m. e. of Pittsburg, the co. seat. It has a national bank, high school, railroad car works, steel works, flour mill, iron foundry, many interests controlled by Pittsburg capitalists, and a weekly newspaper. Pop. '90, 4662.

WILKINSON, a co. in central Georgia bounded n.e. by the Oconee river; 417 sq.m.; pop. '90, 10,781. Sulphur springs are found. Co. seat, Irwinton.

WILKINSON, a co. in extreme s.w. Mississippi, bordering on Louisiana; 592 sq.m.; pop. '90, 17,592, chiefly of American birth, with colored. Co. seat, Woodville.

WILKINSON, JAMES, 1757–1825; b. Md.; served under Arnold in the n., was at Trenton and Princeton, and was appointed by Gates adj.gen. in 1777. In 1778 he became secretary of the board of war presided over by Gates. He resigned in 1779 in consequence of a quarrel with Gates, but was soon appointed clothier-gen. of the army. After the war he removed to Kentucky. In 1791 he was appointed to the U. S. infantry, and led an expedition against the Wabash Indians. He commanded Wayne's right at Maumee Rapids, and was appointed gen.-in-chief in 1796. He was governor of Louisiana, 1805–6; given command along the Mississippi in 1808; three years later he was court-martialed, but acquitted of complicity with Aaron Burr, and of being in the pay of Spain. In 1813 he was made maj.gen., and sent north. His campaign was unsuccessful, mainly on account of Hampton's disagreement with him, and he was superseded. A court of inquiry exonerated him in 1815. The same year he was discharged from the army then being reorganized. The rest of his life was spent in Mexico. He wrote *Memoirs of My Own Times* (1816).

WILKINSON, JEMIMA, 1753–1819; b. R. I.; educated in the society of Friends; when 20 years old after an apparent suspension of life, from the effect of severe fever, she recovered, and asserted that she had been raised from the dead to instruct the living; professed to work miracles; and had a few followers who with her built in Yates co., N. Y., a village named Jerusalem. At her death the sect was broken up.

WILKINSON, Sir JOHN GARDNER, a distinguished traveler and archæologist, was the son of the late Rev. John Wilkinson, of Hardendale, in Westmoreland, and was born on the 5th of October, 1797. Having lost both his parents at an early age he was left under the guardianship of the Rev. Dr. Yates, by whom he was sent to Harrow school in 1813, and to Exeter college, Oxford, three years later. While a boy, young Wilkinson had a strong desire to enter the navy, principally with a view to seeing foreign countries. He also in early life showed a great fondness for architecture and sculpture. While at Harrow he made sketches of all the churches within a radius of some miles from the school; and, while at Oxford, often employed himself in drawing from the objects contained in the Arundel collection. He still further cultivated his taste for architectural antiquities by trips on the continent, made during his college vacations. In the latter part of 1821 he took up his abode at Cairo, where he learned both to read and speak Arabic; he also studied Coptic. Making Cairo his head-quarters he now traveled through and investigated almost every part of Egypt and Lower Nubia. Twice he ascended the Nile as far as the second cataract, and several times as far as Thebes. At the latter famous site he

spent more than twelve months in making explorations; he also visited the deserts on either side of the river, and the Egyptian oases. During subsequent visits he completed the exploration of those deserts, and, in fact, made a complete survey of Egypt, on a scale of about 10 in. to a degree, which unfortunately, for the interests of science, has not yet been published. The same might have been the case with his *Survey of Thebes*, had not the author engraved and published it at his own expense. As a result of his first visit to Egypt, Wilkinson transmitted to the British museum more than 300 antiquarian objects, besides numerous specimens of natural history. Wilkinson's first residence in Egypt extended over a period of twelve years, during which time he composed and published his first two works on Egyptian subjects—viz., *Materia Hieroglyphica; containing the Egyptian Pantheon and the Succession of the Pharaohs, from the Earliest Times to the Conquest by Alexander, and other Hieroglyphical Subjects: with Plates and Notes explanatory of the same.* The preface to this work is dated "Pyramids of Geezeh, July, 1828;" but it was printed and revised for the author at Malta in the same year. This work was followed by *Extracts from several Hieroglyphical Subjects, found at Thebes and other parts of Egypt, with Remarks on the same*—also printed at Malta in 1830, but with a dedication to sir W. Gell, dated "Thebes, 1827." In the same year (1830), he published his *Topographical Survey of Thebes, Tapé, Thaba, or Diospolis Magna*, in six sheets. In 1833, Wilkinson, in consequence of ill health, was obliged to return to England. In 1835 he published *Topography of Thebes, and General View of Egypt* (Lond. John Murray). This was followed in 1837 by *Manners and Customs of the Ancient Egyptians, including their Private Life, Government, Laws, Arts, Manufactures, Religion, and Early History; derived from a Comparison of the Paintings, Sculptures, and Monuments still existing with the Accounts of Ancient Authors: illustrated by drawings of those Subjects* (3 vols. Lond. John Murray). This work at once obtained great popularity, both from the extent and soundness of its information, and the agreeable style in which it was written. It was highly spoken of by the critics; and obtained for him also the honor of knighthood, with which he was invested in 1839. Many things of importance were, however, omitted in it, which he afterward published in *A Second Series of the Manners and Customs of the Ancient Egyptians, including their Religion, Agriculture, etc.* (2 vols. and a volume of plates, Lond. Murray, 1841). Wilkinson again visited Egypt in 1841 and in 1843. He also visited Syria, Constantinople, Tunis, and Sicily, returning to England after an absence of two years, by the Illyrian coast of the Adriatic. During his two years' absence he also visited Dalmatia and Montenegro, which gave occasion to the publication of his *Dalmatia and Montenegro, with a Journey to Mostar, in Herzegovina, and Remarks on the Slavonic Nations; the History of Dalmatia and Ragusa; the Uscoes, etc.* (2 vols., Lond. Murray). Wilkinson's other works are—*Modern Egypt and Thebes; being a Description of Egypt, including the Information required for Travelers in that Country; with Wood-cuts and a Map* (2 vols., Lond. Murray, 1843); *Hand-book for Travelers in Egypt; new edition condensed of Modern Egypt and Thebes* (Lond. 1847, and again in 1858); *The Architecture of Ancient Egypt, with a Large Volume of Plates Illustrative of the Subject* (Lond. 1850); *The Fragments of the Hieratic Papyrus at Turin, containing the Names of Egyptian Kings, with the Hieratic Inscription at the back* (Lond. 1851); *A Popular Account of the Ancient Egyptians, revised and abridged from his larger Work* (Lond. 1854); *The Egyptians in the Time of the Pharaohs;* to which is added an *Introduction to the Study of Egyptian Hieroglyphs*, by S. Birch (Lond. 1857), published as a companion to the Crystal palace guides; *On Color, and on the Necessity for a General Diffusion of Taste among all Classes; with Remarks on laying out Geometrical Gardens, illustrated by Colored Plates* (Lond., 1858). His death took place in 1875.

WILKINSON, William Cleaver, D.D.; b. Westford, Vt., 1833; graduated at Rochester univ., 1857, and at the theol. sem., 1859. He was pastor of the Wooster-place Bapt. church, New Haven, Conn.; prof. modern languages at Rochester univ., 1863–64; pastor of Mount Auburn church, Cincinnati, 1865–66; prof. of homiletics and pastoral theology at Rochester theol. sem., 1872–81. He is counselor of the Chautauqua lit. and scientific circle, and dean of the depart. of lit. and art in Chautauqua univ. Among his works are, *The Dance of Modern Society*, first ed., 1869; *A Free Lance in the Field of Life and Letters*, 1874; *The Baptist Principle; Poems; Edwin Arnold as Poetizer and Paganizer; College Greek Course in English.* He became prof. at the Chicago Univ. 1892.

WILL. The mind is divided into three distinct functions—feeling (see Emotion), intellect or thought (see Intellect), and will or volition. Under will, is included the putting forth of active energy to move our own organs, or change something about us, but all energy is not voluntary energy. The peculiarity of action from will, in contrast to other activities, as the powers of nature—wind, gravity, etc., is its being preceded or inspired by *feelings*, or by the pleasures and pains of an individual mind. Hence, will is defined, *action prompted by feeling.* The feelings that prompt the will, called motives, are our pleasures and our pains; pleasure felt or imagined moves us to continue and increase the pleasurable state; pain urges us to work for the abatement of the pained condition.

In the maturity of the powers, a human being, or animal, can perform a great variety of specific actions at the bidding of the various wants or desires. The sensation of thirst induces at once a series of complicated movements, ending in the relief of the painful feeling. But no man or animal is born with the ability to make a journey to a well, whenever thirst is felt; the human infant cannot even perform the voluntary act of lift-

ing anything to its mouth. Our most ordinary voluntary movements are the result of an education; and the explanation of the volitional energies consists in ascertaining what are their beginnings or germs in the mental constitution, and how they are brought to the finished state.

Three different facts of our nature appear to concur in forming the collective aptitudes of the will:

I. The fact termed spontaneous activity, or the self-acting energy of the system, whereby movements arise without waiting the stimulus of the senses. Any actively disposed animal, after rest and nourishment, begins to move merely through a surplus of nervous power, and not because it is wakened out of dormancy by the solicitations of sensible objects. Without this tendency to commence movements in the first instance, there would be no apparent basis for the voluntary acquirements. See SPONTANEITY. In imitation with the voice, for example, we must begin by uttering sounds, and then discover by the ear their agreement or disagreement with the sounds heard.

II. The second fact is the tendency to abide by a movement giving pleasure, and to relax a movement coincident with pain. From the first moments of sentient life, every animal appears to possess this property. If a movement happens to coincide with an access of pleasurable warmth, the animal maintains, and possibly increases, the movement: if the warmth passes into pain, the movement ceases. The infant sucks so long as the feeling is pleasurable, and ceases when satiety comes on. This power may be an offshoot of the general law connecting pleasure with an increase, and pain with a diminution of vital energy. See EMOTION. However arising, the fact is unquestionable, and is exemplified all through life. Without our going through any process of deliberation or resolution, we sustain an activity that brings us agreeable sensation, and remit an activity ending in pain. We keep our eyes fixed on a cheerful flame, and withdraw them when the glare is overpowering; the process is self-acting and intuitive.

III. The third fact is the operation of the retentive power of the mind, in joining together, by a permanent association, movements and feelings that have existed together for some time. This is a branch of the great law of contiguous association. See ASSOCIATION OF IDEAS. The will is an educated function, and education supposes the plastic or fixing operation expressed by the above-named law.

But the chief nicety in explaining the growth of the will consists in showing how the proper movements and feelings originally came together. This is the problem of the development of voluntary power, which would demand an extended illustration. A brief indication of the process must suffice.

One of the easiest examples is the moving of the head to follow a light or other object pleasing to the gaze. This power is not possessed at the commencement of life, and the process of arriving at it is supposed to be as follows: The child has its eyes fixed on the light, and enjoys the luminous excitement. The light is moved to one side, and is therefore lost to the direct gaze, and there is no power to recover it. An accidental movement of the head, occurring by mere spontaneity, carries the eyes round to encounter the light again, or to follow it as it moves; the consequence is, that the recovered pleasure of the spectacle sustains the movement that brings it. Now, every such coincidence tends to become fixed, by the law of plastic association; and after a few repetitions of the accidental concurrence, there is a connection formed between the optical impression and the movement that is found to go along with and sustain it. Thus it is, that a movement of the object to the right hand, which leaves a characteristic trace on the visual organ, becomes associated with a movement of the eyes and the head to the right hand; and whenever the optical fact arises, the movement is apt to follow. This makes one distinct item in our volitional acquisitions; one instance of the power of definitely acting to a definite feeling.

Another example might be taken from the feelings of warmth and chillness—both very powerful sensations in all animals. One of the most obvious means of attaining comfortable warmth is to crouch and bring all the limbs close to the body. A very early experience would connect this posture, accidentally hit upon, with the comfortable sensation; and, by virtue of the primary law of the mind, connecting pleasure with exalted energy, the movement, once coinciding with the pleasure, would be sustained and adhered to, so long as it brought the pleasure; and in course of a few repetitions, a definite association would be formed between the state of chillness and this mode of relieving it. By a more lengthened and round-about process, more complicated associations would be formed, such as coming close to the warm body of a companion, running into shelter, approaching a fire, going into the sunshine, etc.; but, in all cases, the only mode of attainment that can be pointed out, is (1) the concurrence of spontaneous movements with feelings of pleasure, or relief from pain; (2) the maintenance of those movements by the first law of self-conservation; and (3) the forming of a link between the two by the force of plastic association.

The illustration may be varied by viewing the case from the side of pain. The immediate and direct result of pain, from the dawn of sentient life, is to lower active energy for the time, and therefore to arrest whatever movements are in progress; this is the general rule, although there is an important exception in the case of acute or pungent pains, which, in the first stage, stimulate and excite the active members. Hence, when a movement happens to coincide with a pain, it is liable to be arrested; a bitter morsel in the mouth makes one cease chewing, by reducing the active power for the moment. The primitive endowment of the system would lead to nothing further, until some chance

movement of the mouth tended to get rid of it, which movement would be promoted and sustained by the pleasurable feeling of relief, which is the operation of the principle from the other side.

The growth of the will is conspicuously shown in imitation, which is an acquired aptitude, and a department of our voluntary power. In imitation there must be (1) a spontaneous tendency to move the active organs concerned—the voice, the mouth, the hands, etc.; (2) a sense of the effect, with a certain pleasure in attaining it; and (3) a cementing process, as already described. In learning to speak, the infant must first articulate something of its own accord; the resulting sound affects its own ear, and is discovered to coincide with a sound heard from others. The frequent repetition of the articulate effort leads to its being coupled in the mind with the sound that it gives; and when this association is mature, the sound heard will induce the articulating movement; and this is the power of imitation. But previous to the opportunity of associating the exertion of the mouth, throat, and lungs with the sound emitted, there does not appear to be any capability to imitate articulate sounds. The same would apply to imitation by the hands.

The will in its full development includes not merely a series of associations of movements with the ordinary pleasures and pains, but also the power of performing actions to the word of command, the imitative faculty just discussed, and the power of acting from a mere wish to perform a certain action, or to produce a certain effect upon things about us—as to open a window or stir the fire. It might be shown that all these various aptitudes grow, by successive stages, out of the three fundamental facts above described. The process involves many struggles and failures, from there being so much in it depending on accidental commencements; hence one reason of the slowness of the early education of human beings.—See also FREE-WILL.

WILL is, in English law, a writing by which a person entitled to property declares what is to done with such property after his death. Though, by the Wills act, 1 Vict. c. 26, a writing is indispensable to a will, yet there is an exception in the case of soldiers or sailors who, from their occupation, and while in actual service, are allowed to make a verbal or nuncupative will; and this exception only extends to their personal estate, for they must make a written will, like other persons, in order to deal with their real estate. An infant or person under 21 years of age, cannot, since 1838, make a will. A married woman can only make a will if she has separate property, or her husband assents to her will, or she makes the will by virtue of some power of appointment vested in her. As a general rule, it is absolutely necessary that the party making a will should have a free and disposing mind at the time; and hence, if he or she is a lunatic, or drunk, or acting under compulsion, fear, or undue influence, the will is invalid. There is no limit as to the time preceding death when a will may be made; it is enough that the testator was at the time capable and sensible, though he died immediately after. A will must be executed in presence of two witnesses, who see the testator sign the will, or at least hear him acknowledge it. But there is no particular form of words in which a will must be made for the purpose of disposing either of realty or personalty. The will must be in writing, but it need not be in ink or written continuously. The testator may sign by his mark or by an assumed name. Though a seal is not equivalent to signature, yet a person may have a stamp to sign papers with, and that will be sufficient for a will also. The testator need not sign the will if he authorize some one to do so for him in his presence. The signature must be at the foot or end of the will; but if it is placed so as to lead a court to the conclusion that it was intended to give effect to the will, that will be enough. Though the witnesses need not know it is a will, they must be present together when the testator signs it or acknowledges his signature. The witnesses must sign their names or make their marks. A legatee, or the wife or husband of a legatee, may be an attesting witness, but by being so, he or she will forfeit any legacy left to him or her by the will. But one may be an executor though he attests the will. A will is revoked by the marriage of the testator or testatrix. The mere fact of making a subsequent will does not of itself operate to revoke a prior will, unless there is some inconsistency in whole or in part; and, as a general rule, no will will be revoked by any presumption of an intention on the ground of an alteration in circumstances. The usual way of revoking a will is to burn, tear, or destroy it with the intention of revoking the same; or by executing another will which expressly revokes the prior will. When a testator tears or cuts away that portion of his will containing the signature and attestations, the presumption is that he intended to revoke the whole. But merely cutting out a part of the will, or striking it through with a pen, does not amount to a revocation. It is to be borne in mind that, in order to revoke by tearing, etc., there must be an intention to revoke, so that a mere accidental tearing will prevent the act from having the force of revocation. When there are interlineations or alterations in a will, it is presumed these are made after signature, unless there is evidence to prove the contrary. A will which is in any manner revoked can only be revived by re-execution, or by a codicil showing an intention to revive it; but many nice questions have arisen as to what causes a will to revive.—In Scotland a will is used only to denote a testament affecting personal or movable property; while a will affecting real or heritable property can only be made by way of a deed having a present operation. A will

or testament may be written in the hand-writing of the testator, and if signed by him, will not require witnesses, being then called a holograph will. In other respects, wills are subject to nearly the same rules which prevail in England with respect to revocation, etc. Wills of real property are called dispositions or deeds, and have a present operation, and the mode in which they are drawn up is that of conveying the property to the disponee, but reserving the testator's life-rent. The effect of this is that the testator retains the property in his own hands while he lives; but the moment he dies, the disposition *mortis causa* comes into play, and the disponee then takes the property, subject to the deed. In the United States the law in regard to the making, attesting, and probating wills is governed by the statutes of the different states, which, though they disagree in many particulars, are in most points governed by the common law principles above enunciated. Nuncupative wills are regarded with distrust, and the making of them closely restricted by statute. The English statute making the will of any person under 21 invalid has been adopted in many states. The rights of married women in regard to wills have been greatly extended in most states; though the harsh common law doctrine that a *femme coverte* can make no will without the husband's consent is retained in a few. Monomania may or may not be a disability, according as the nature of the delusion does or does not affect the testator's capacity to judge sanely in regard to the disposition of his property. The law is far less stringent as to the wording than as to the execution and attestation of a will. The language may be both informal and ungrammatical; it is enough that it expresses the intention clearly. But the attestation must be precise. Two usually, sometimes three, witnesses are necessary. In a few states a *holograph* of personalty need not be attested. The provisions of the statute of frauds in regard to wills are in force in all the states. Implied revocation is, therefore, in most cases barred, nor can courts of equity reform a will upon proof of *mistake* as in the case of contracts. The common law rule that marriage and the birth of a child after the execution of a will was a revocation is sustained in most states, but with some limitations. It is not necessary that there should be witnesses to the voluntary canceling, burning, or destroying of a will by the testator. The republication of a will occurs where a will has been formally revoked but not destroyed, and has again been made valid by a second attestation. Though the will dates from the death of the testator, the language must often be construed in reference to the time of execution. The method of proving wills is described under PROBATE COURT. See DEED, LEGACY.

WILL, a co in n.e. Illinois, adjoining Indiana; about 850 sq.m.; pop. '90, 62,007, chiefly of American birth. Bituminous coal is found. Co. seat, Joliet.

WILLAMETTE RIVER, a river in Oregon, rising in the Cascade mountains, and flowing n.w. and n. until it empties into the Columbia river. On its banks are Portland and Oregon City. It is always navigable as far as Portland, and by means of locks and a canal at Willamette Falls, 25 m. from its mouth, small steamboats can for the greater part of the year reach Eugene City, 130 m. from the mouth of the river.

WILLARD, EMMA C. (HART), 1787–1870; b. Conn.; taught a district school at the age of 16; was a teacher at Middlebury, Vt.; married there Dr. John Willard, 1809, and opened a boarding school for girls; submitted plans for a higher seminary to Gov. Clinton of New York, and with his approval opened one at Waterford, 1819, removing it to Troy, 1821, and conducting it with great success till 1838, when she resigned it to her son and settled at Hartford, Conn., devoting herself to the improvement of her numerous school books and to public labors for the promotion of education.

WILLARD, ERASTUS, 1800–71; b. Mass.; graduated Waterville college, Me., 1824, studied theology at Newton theological seminary; was pastor of a Baptist church, Grafton, Vt., 1833; went to France, 1835, and instructed candidates for the ministry; returned 1856, and was a missionary among the Ottawa Indians, 1856–59; settled at Salem, N. Y., 1859–65, and afterward at Newport, R. I.

WILLARD, FRANCES ELIZABETH, b. N. Y., 1839; graduated at North-western college, 1858; taught in various western towns; was principal of the Genesee Wesleyan seminary, Lima, N. Y., 1867; elected president of the Evanston college for women; connected with the North-western university, Chicago, 1871–74; 1874–79, correspond. sec. Woman's christian temperance union, becoming pres. in 1879; in 1882 became member of executive committee prohibition party; in 1883 founded the World's christian temperance union; 1888, became pres. American branch International council of women. Has pub. *Nineteen Beautiful Years; Woman and Temperance,* etc.

WILLARD, JOSEPH, D.D., LL.D., 1738–1804; a great-grandson of President Samuel; b. Me.; went to sea in early youth; graduated at Harvard college, 1765; tutor there, 1766–72; became colleague pastor of the Congregational church at Beverly, Mass., 1772; and president of Harvard college, 1781–1804. Among his published writings are several sermons; a Latin address on the death of Washington; and scientific papers in the *Memoirs of the American Academy* and the *Philosophical Transactions.* He was also a noted Greek scholar, and left an unpublished grammar of the language.

WILLARD, SAMUEL, 1640–1707; b. Mass.; graduated Harvard college, 1659; minister of Groton, 1663–76, whence he was driven during king Philip's war; colleague with the Rev. Thomas Thacher of old South church, Boston, 1678, and afterwards his suc-

cessor; vice-president and acting president of Harvard college, 1701, until his death. He opposed the proceedings of the court during the witchcraft prosecutions. He published *Brief Animadversions*; *The Fountain Opened.* A posthumous folio volume was published entitled, *A Complete Body of Divinity*, consisting of lectures given for 19 years.

WILLARD, Simon, 1605–76; b. England; came to America in 1634; and was the founder of Concord, Mass., and a resident of Groton, Salem, and Charlestown, where he was a magistrate. In king Philip's war he served as major of the militia.

WILLCOX, Orlando Bolivar, b. Mich., 1823; graduated at West Point, 1847, and was commissioned in the artillery. He served in Texas and Florida; resigned, 1857, and practiced law until 1861, when he became col. of the 1st Michigan volunteers, the first western regiment at the front. He joined with Ellsworth in taking possession of Alexandria; took part in Bull Run, Antietam, Fredericksburg, the Tennessee and Richmond campaigns, and distinguished himself at Spottsylvania and Petersburg. He left the volunteer service with the brevet rank of maj. gen. Under the pseudonym of "Major March" he wrote *Shoepack Recollections*, and other books. He became col. of 12th regiment, U. S. A., and in 1886, brig.-general; retired in 1887, and from 1889 to 1892 was governor of the Soldiers' Home, Washington, D. C.

WILLEMS, Florent, b. Belgium, 1823; studied art at Mechlin and at Paris, where he settled in 1839. He ranks high among the *genre* painters of that city. Among his best pictures are: "Une Partie du Music," "Visite de Marie de Médicis à Rubens," "Au Roi!" "La Sortie," "Sealing the Love-letter," and "The Music Lesson."

WILLEMS, Jan Franz, a distinguished Flemish philologist and writer, and noted as one of the originators of the great Flemish national movement, was b. in 1793, at the little village of Boechout, near Antwerp. Willems, at the age of twelve, was sent to the town of Lierre, to learn singing and music, for which he had early evinced considerable aptitude. At Lierre, which continued to be the seat of some of those ancient Belgian literary associations known as "Rêderyk-Kamers," or chambers of rhetoric, mysteries and other scenic representations were given from time to time in connection with these institutions; and during Willems's residence in the town he was frequently called upon to take part in these singular entertainments, a circumstance to which he ascribed his first impulse toward the study and cultivation of the old Flemish language and literature. The talents which he exhibited in his acting, and in the composition of satirical verses, attracted the notice of several influential persons at Lierre, through whose agency he was sent to Antwerp, to study in the office of a notary; and in 1812 he contended successfully for the prize awarded for the best poem on the battle of Friedland and the peace of Tilsit. From this period his poetical and dramatic compositions followed each other in rapid succession. His ode *Aen de Belgen* (To the Belgians), which appeared in 1818, in which he exhorted his countrymen to resume the use of their native Flemish, and his clever treatise on *De Nederduytsche Tael en Letterkunde* (1819–24), in which he traced the history of the Flemish and Dutch tongues from their common origin to their gradual but slight divergencies, marks an epoch in the literary history of Belgium. The Dutch government showed their sense of his anti-French tendencies by giving him the post of keeper of the archives at Antwerp, while the royal institute at Amsterdam elected him a member of its learned corporation; but the Catholic party in Belgium, resenting the attempt made by Willems to refer the decline of Belgian national renown to the abandonment of the Flemish vernacular, looked upon his writings with mistrust; and in 1830, when Belgium was definitely separated from Holland, the dominant Belgian party deprived Willems of his office, and left him for a time in obscurity and neglect. In 1835, chiefly through the influence of his old opponent, S. Van de Weyer, he was, however, promoted to the place of keeper of the archives at Ghent, where he continued to reside in the enjoyment of numerous literary successes and national honors till the period of his death, which took place in 1846. Willems had the satisfaction, during the latter years of his life, of seeing the gradual growth of the Flemish movement, which, since his death, has continued to advance with steady progress, and has resulted in the formation of many literary societies, the publication of numerous literary and historical remains of the old Flemish, and a more general cultivation of the vernacular. Among the numerous Flemish works published by Willems, special notice is due to his version of the mediæval poem of *Reineke Vos* or *Reynard the Fox*, for which he claims a Flemish origin; while, among the more important of his strictly national works, we may instance his editions of the rhymed chronicles of Jan de Klerk and Jan van Heelu, and his *Mengelingen van Vaderlandschen Inhond.* See Flemish School.

WILLEMSTAD, a fortified t. in North Brabant, on the Hollandsdiep, 19 m. n.w. of Breda, erected by William I., prince of Orange, to protect the traffic between Holland and Zeeland. There are bastions, forts, inundation sluices, and a good haven. Population about 2000. In 1793, baron van Boetzelaar successfully defended Willemstad against the French, under Dumouriez, who, after a heavy bombardment, were obliged to break up the siege. It was the birthplace of the naval hero, Callenberg, who, when De Ruyter fell in action with the French, succeeded to the command.

WILLEMSTAD, chief t. of the island of Curaçao (q. v.).

WILLET, *Symphemia semipalmata*, a bird of the family of *scolopacidæ*, a native both of North and South America. It is about 15 in. long; dark ash-color above; the

rump, upper tail coverts, and under parts white, the tail grayish, the tail-feathers, all except the two middle feathers, spotted with dark-grayish brown; the secondaries of the wings white, with dark-brown spots. The bill is two inches and a half in length, very thick, compressed; the wings long; the legs long and strong, the tail short and nearly square; the toes partially webbed. This bird is found in summer as far north as the coasts of New England; in winter, it retreats to the gulf states. The flesh is highly esteemed, and the eggs are reckoned a delicacy. Willets are usually seen in flocks, and generally near the sea. The name is derived from the note.

WILLETT, MARINUS, 1740–1830; b. N. Y.; a lieut. in Delancy's regiment in the French wars. He was at the attack upon Ticonderoga, and went with Bradstreet's expedition against fort Frontenac. He accompanied Montgomery in his Canada campaign, and in 1777 defended fort Stanwix against a mixed force under St. Leger, and held out till Arnold came to his assistance. After the war he settled in New York, of which he was sheriff, 1784–92, and mayor in 1807.

WILLETT, THOMAS, 1611–74; b. England; a merchant in the Plymouth colony, who removed to New York when it passed into the hands of the English. He was the first mayor of that city. He afterwards removed to Barrington, R. I., where he died.

WILLEY, HENRY, b. N. Y., 1824, educated at the Bridgewater, Mass., normal school, practiced law in New York state, but went to Massachusetts in 1858, and afterwards became editor of the New Bedford *Evening Standard*. He has given considerable attention to botany, and especially to the study of the North American lichens. Among his works are *List of North American Lichens* (1873), *Enumeration of the Lichens found in New Bedford, Mass.* (1892), and numerous papers on lichens, contributed to scientific journals or transactions.

WILLIAM I., King of England, commonly called *William the Conqueror*, was the illegitimate son of Robert, surnamed *Le Diable*, duke of Normandy. He was born in 1027, and succeeded to the dukedom on the death of his father, in 1035. Previous to his father's death, he had been intrusted to the care of Henry I. of France; but it was owing rather to the quarrels and jealousies of his own subjects than to the protection of Henry, that he was able to preserve his dominion intact, until his arrival at manhood. In 1047 he gained a victory at Val de Dunes over a powerful competitor, Guido of Macon; and in 1054 he defeated another rival, Guillaume, count of Arques, being aided in both contests by the French. His ambition now began to extend to England, where Edward the confessor reigned at this time. On visiting England, William found his hopes of succeeding Edward much strengthened by the dominance of Norman influence in the councils of that monarch. On Edward's death, however, the Witenagemôte (q.v.) chose Harold (q.v.) to fill the English throne; ignoring, according to the monkish chroniclers of Norman bias, in so doing, an alleged bequest of Edward in favor of William. The Norman asserted his pretended rights by a powerful invasion, and the result was his acquisition of the crown by the famous battle of Hastings, Oct. 14, 1066. Harold having been killed in the fight, the Saxons chose Edgar Atheling as his successor. Edgar, however, was soon obliged to yield, and William was crowned king of England, Dec. 25, 1066; from which day his reign is dated. Edgar remained for some time at his court, and his treatment of the conquered people was at first mild and conciliatory; but his savage suppression of a rebellion, which broke out in the n. in 1070, laid the foundation of an irreconcilable antipathy between Saxon and Norman, which rendered a continuance of this policy impossible. Before long, William began to rule like a true conqueror. Everywhere, the Saxons were reduced almost to a state of slavery. The higher classes were deprived of every office of church and state, while the people were ground down by new and oppressive taxes. Fortresses were erected over the country, and garrisoned to overawe the Saxon inhabitants. In 1072 the Saxons were so far reduced to submission that William found time to lead an army across the border into Scotland, in order to punish the king of that country Malcolm Canmore, for having received and protected Edgar Atheling. The conqueror marched as far n. as the Tay, and received a nominal submission from Malcolm. In 1085 an attempt was made to overturn the power of the English king by Canute, king of Denmark. A great naval armament was got together for the purpose of invasion, but the enterprise was abandoned, its abandonment being caused partly by bad luck, and partly, it is supposed, by a skillful application of William's treasure. The tax called the *Danegelt* (q.v.) was reimposed to meet the expense caused by the threatened war. Disputes having arisen between William and his son Robert respecting the duchy of Maine, which had come to William through his marriage, Nov. 2, 1053, with Matilda, daughter of Baldwin, 5th earl of Flanders, father and son took up arms against one another. The dispute was ultimately adjusted through the intercession of queen Matilda. Most of the latter part of William's life was spent in Normandy, the government of England being intrusted mainly to his half-brother, Odo, bishop of Bayeux. William was of a corpulent habit of body, at which fact it seems that his brother monarch, Philip I. of France, had pointed some sarcasm. William, in a fit of wrath, raised an army and invaded France. He took the city of Mantes, and set it on fire; but while in full enjoyment of the blaze, his horse, stumbling on some hot embers, threw him, and the injury he received proved fatal. He died Sept. 9, 1087. Stern and ruthless as William undoubtedly was, he yet knew how to govern a nation and protect it from foreign aggressions. For more than two centuries England had been harassed by the frequent descents of piratical hordes. He put an

end to these. Never after William's time did a Norse rover venture to show face on the English coast. In the common administration of justice he was royally impartial, many of his severities are even referrible in part to his thorough hatred of anarchy; while his attitude toward the church is admirable. He clearly defined the limits of ecclesiastical judicature, and when the formidable Hildebrand desired that the conqueror should do homage to him for the kingdom of England, the latter boldly refused.

WILLIAM II., King of England, surnamed *Rufus*, second son of William the Conqueror, was born in Normandy in 1056. He was educated by the celebrated Lanfranc, archbishop of Canterbury. He was the favorite son of his father, who, on his deathbed, recommended him to the barons and prelates as his successor to the crown of England. William was, at the time of his father's death, along with him in Normandy. But no sooner had the event taken place than he sat out for England. Landing at Dover, he obtained possession of its castle and of several other fortresses. He then presented himself to Lanfranc, who proposed him to the nobles and prelates as their king. No opposition was offered, and William was crowned on Sept. 26, 1087. Meanwhile, his elder brother, Robert, had entered upon possession of the duchy of Normandy. The relative position of the brothers was such as, in these times, was sure to lead to war between them. Robert, at the instigation of Odo, bishop of Bayeux, endeavored to excite an insurrection in England. This attempt having failed, William, in revenge, invaded Normandy in Jan., 1090. An arrangement having been ultimately come to through the mediation of Philip I. of France, Robert and William then turned their united arms against their third brother, Henry, who had purchased from Robert the district of Cotentin, comprising nearly one-third of Normandy. The fortune of war went against Henry, who was driven into exile. Returning to England, William's next enterprise was an invasion of Scotland. The life of William seems to have been a continual scene of strife. Returning from Scotland, he felt himself called upon to renew the contest with his brother, who had, meanwhile, strengthened himself by an alliance with Philip of France. A pecuniary payment, however, by William to Philip soon dissolved the bond between him and Robert. William would now, doubtless, have taken signal vengeance on his brother, had he not been recalled to England by disturbances in Wales and in the north. In the year 1096, Robert, having resolved to go to Palestine, sold his duchy of Normandy to William, for £10,000. This transaction led to a contest between William and a chieftain named Helie de la Flêche, who had all along disputed Robert's right to the Maine district of Normandy. Helie was not, however, able to withstand the English monarch, who now took the field against him. He was obliged to disband his forces and take to flight. This was the last warlike achievement of William Rufus. He was shot (it is said, accidentally, though there appears equally good reasons to believe the act intentional) by an arrow, supposed to come from the bow of sir Walter Tyrrel, while hunting in the New forest, Aug. 2, 1100. His body was found by a poor charcoal-burner, who conveyed it in a cart to Winchester. William inherited the courage, energy, and political talent of his father, but he was ruthless and unprincipled.

WILLIAM III., King of England, was the posthumous son of William II. of Orange, and Mary, eldest daughter of Charles I. of England. He was born in 1650. The alliance of his family with the Stuarts excited the jealousy of Oliver Cromwell, and by his influence the young prince and his descendants were declared to be excluded from the stadtholdership of the United Provinces. William "found himself," says Macaulay, "when first his mind began to open, the chief of a great but depressed and disheartened party, and the heir to vast and indefinite pretensions, which excited the dread and aversion of the oligarchy, then supreme in the United Provinces." The restoration of the Stuarts, however, in England greatly improved his prospects; and on the murder of De Witt, William, then in his 22d year, was chosen stadtholder. The republic was at this time carrying on an apparently hopeless war with its powerful neighbor, Louis XIV. of France; but by the wisdom and determination of the young stadtholder, the contest, which lasted for nearly seven years, was in 1678 terminated by the treaty of Nimeguen, in a manner highly advantageous and honorable for the United Provinces. A few years before, their ruin had seemed inevitable; and the fame of William became great over Europe. Shortly before this event, he had married his cousin, the princess Mary, eldest daughter of the duke of York, afterward James II. of England. This marriage, entered into solely from political considerations, did not at first prove a happy one. William seems to have been jealous of his wife's position, and too reserved to give utterance to his feelings. According to Macaulay, a complete explanation and reconciliation were ultimately brought about by the agency of bishop Burnet.

In 1686 William became the head of a league formed among the Protestant princes of Germany, the kings of Spain, Sweden, and others, having for its object to curb the power of Louis XIV. The treaty by which the alliance was constituted was signed at Augsburg in July, 1686. In England the tyranny of James II. was now beginning to estrange from him the affections of every class of his subjects. The eyes of all were turning toward the stadtholder as their only hope. Having formed his resolution, William conducted his operations with great secrecy and skill. On Nov. 5, 1688, he landed at Torbay, with an army of 15,000, composed of English and Dutch. His success was rapid and bloodless. Men of influence of all parties gave him their

presence and support; and on Dec. 18 following, he entered London triumphantly as a national deliverer. The adherents of James held out for some time in Scotland and Ireland; but the death of Dundee ended their resistance in the former country; while in the latter it was ended in 1691, after a vigorous contest of two years, in which the Stuart party had, in most cases, the advantage. The object of William in accepting the crown of England was probably not so much to free the English nation from the tyranny of James, as to enlist its power on his side against that of France. In spite of his sterling qualities, and of the debt which they owed to him, the English nation never really liked William III. The death of his wife, in 1694, on whom the crown had been conferred jointly with himself, materially injured his position. His schemes were thwarted by parliament; continual plots for his assassination were hatched by the adherents of James; and in his warfare with France, victory was almost always on the side of Louis, William being in person repeatedly defeated by Luxembourg (q.v.); and it was not without a struggle and a pang that he agreed to the terms of the peace, eminently popular, however, which was concluded at Ryswick on Sept. 10, 1697. The death of Charles II. of Spain in 1700, and the succession of Philip of Anjou, was another blow to his policy. He carried it on, however, with unflagging vigor till his death, which was occasioned by a fall from his horse, on Mar. 8, 1702. The massacre of the Macdonalds of Glencoe (q.v.), and his conduct to the promoters of the Darien scheme are two blots on William's reputation which his most thoroughgoing apologists have been unable to efface. However, he was undoubtedly a practical genius of the highest order, and the services which he rendered both to England and to his native country can hardly be overrated. During his reign the bank of England had been founded, the modern system of finance introduced, ministerial responsibility recognized, the liberty of the press secured, and the British constitution established on a firm basis. In his domestic life he committed the error of a too stern repression of all manifestation of kindly or genial feeling. His manner was wholly Dutch, and even his countrymen thought him blunt. "In his intercourse with the world in general," says lord Macaulay, "he appeared ignorant or negligent of those arts which double the value of a favor, and take away the sting of a refusal."

WILLIAM IV., King of Great Britain and Ireland, third son of George III., was born on Aug. 21, 1765. Until 1771 he remained, along with the prince of Wales and prince Frederick, under the care of Dr. Majendie. He was then sent to Kew, where, with prince Edward, afterward duke of Kent, he was under the guardianship of col. Bude. On June 15, 1779, he entered the navy as midshipman on board the *Prince George*, then under rear-admiral Digby. The *Prince George* then joined Admiral Rodney's squadron, on its way to Gibraltar. After seeing a considerable amount of service, prince William was made a lieut. on June 17, 1785; and in the year following he received his commission as capt. In 1789 he was created duke of Clarence and St. Andrews, and earl of Munster, with an allowance from parliament of £12,000 a year. Subsequent to this, several acts of insubordination rendered an actual continuance of his professional career impossible. He was, however, formally promoted through the successive ranks until he was made admiral of the fleet in 1801. Meanwhile, however, he had been living almost entirely ashore, with Mrs. Jordan (q.v.), a celebrated actress, with whom he had become connected in 1791. By her he had a family of five sons and five daughters, who became known by the surname Fitzclarence, and were raised to titular dignities. On July 11, 1818, he married Adelaide, eldest daughter of the duke of Saxe-Meiningen. The issue of this marriage was two daughters, both of whom died in infancy. By the death of the duke of York, in 1827, the duke of Clarence became heir-presumptive to the throne, to which he succeeded, on the death of his brother, George IV., on June 26, 1830.

The great event of the reign of William IV. was the passing of the reform bill. After a fierce and protracted struggle, the bill was read a third time in the house of lords on June 4, 1832, and three days afterward it received the royal assent. The first reformed parliament met on Jan. 29, 1833. The abolition of colonial slavery, the reform of the poor-laws, and of the Irish church, were the immediate results of the great constitutional change. King William died, after a short illness, on June 20, 1837. He was succeeded by his niece, Queen Victoria.

WILLIAM THE LION, one of the early kings of Scotland, succeeded his brother, Malcolm IV., in 1165. He is commonly called William the Lion, but why he obtained that title is one of the mysteries of history. When heraldry long afterward became a science, and was supposed to have been in use earlier than it really was, it was not unnaturally supposed that he was the first king who used, as a heraldic achievement, the lion, afterward the chief feature in the arms of Scotland. His predecessors had long contested with the kings of England the sovereignty of Northumberland and other districts of what is now the north of England. Under Malcolm, these claims were virtually abandoned, and the king of Scots received, as a sort of equivalent for them, the earldom of Huntingdon and other valuable estates holding of the English crown. William had still, however, a hankering after the Northumbrian districts. He attended Henry of England in his continental wars, and is supposed, when doing so, to have pressed for a portion at least of the old disputed districts. In his disappointment, he

invaded them, after the example of his ancestors. On July 13, 1174, he fell, almost by accident, into the hands of an English party. For security, he was conveyed to Normandy, and there he consented, as the price of his liberation, to perform that homage for his kingdom which the English kings so long in vain attempted to exact from the government of Scotland. How far the Scots community would have admitted that he had a right to bind them to such a condition, may be doubted. The treaty of Falaise, however, as the transaction was termed, from the place where it was adjusted, was revoked in the year 1189 by Richard I. of England, in consideration of a payment of 10,000 marks, which he wanted for his celebrated expedition to Palestine. William had several disputes with the church, but he was one of the early benefactors of the regular ecclesiastics, and founded, in 1178, the great abbey of Arbroath, which he dedicated to Thomas à Becket, who had been slain eight years earlier. King William died in 1214.

WILLIAM, Prince of Orange, and Count of Nassau, the founder of the independence of the Netherlands, was born at Dillenburg, April 16, 1533. His father, William, was the second son of count John of Nassau-Dillenburg, and succeeded to the German possessions of the family; while his elder brother, Henry, obtained the extensive estates in Luxemburg, Brabant, Flanders, and Holland. The latter also, by his marriage with Claudie of Chalons, added the charming and valuable little principality of Orange to his already extensive domains; but his son René, dying without issue, left Orange along with the Low Countries' estates to William, in 1544. William had hitherto lived at Dillenburg under the care of his father, who was a zealous Lutheran; but on his becoming the most powerful lord of the Low Countries, he was sent to the queen regent's court at Brussels, and brought up in the Catholic faith. At the age of 15 he became page to the emperor Charles V., who took an almost paternal care of him, attentively watched the development of his character, and, satisfied with the result, took him into his inmost confidence, making him the safe repository of the most important secrets, employed him in various diplomatic offices, and, in 1555, promoted him, over the heads of all his veteran officers, to the command of the imperial army on the French frontier. In all these various situations, William acquitted himself completely to his patron's satisfaction; displaying acute intelligence, sound judgment, and a precocious knowledge of men, while bearing himself with a grace and dignity of manner that gained universal esteem. Charles, on his abdication, strongly recommended William to his son Philip as a confidential adviser; and accordingly, we find him employed to draw up the treaty of Cateau-Cambresis, and selected as one of the four hostages to be given to France for its fulfillment. During William's residence in France, he was confidentially informed by Henry II. of a secret arrangement which was being formed between France and Spain for the complete extermination of heretics in both countries; and with admirable nerve, dissembling his horror of the project, he resolved in his own mind to oppose the execution of the scheme in the Netherlands to the uttermost of his power. On returning to the Low Countries, he became the leader of the party which devoted itself to the maintenance of the chartered liberties of the country, agitated for the recall of the Spanish troops, opposed the augmentation of the number of bishoprics (a pet scheme of Philip's, for his opposition to which he first incurred the bitter dislike of his sovereign), and finally broke entirely with cardinal Granvelle, the president of the council, and the willing agent of Philip's tyranny. Expostulations to the regent Margaret of Parma, and directly to Philip himself, far from producing any good result, seemed only to hurry the bigoted monarch to more extreme measures; the cruel edicts against heretics were made still more stringent, and at the end of 1564 the inquisition was established. William, however, steadily refused to allow these oppressive enactments to take effect in his hereditary governments of Holland and Zealand; and though he did not join in the famous protest known as the "compromise" which was presented to the regent by the "beggars," he supported their proposals at court, seeing that, though maintained with somewhat too much violence, their aims were the same as his own. For the next few years he was unremitting in his exertions to impress both the rulers and the people with the desirableness of moderation, and on several occasions succeeded by his personal influence in repressing religious dissension. Hitherto he had labored conjointly with counts Hoorn and Egmont, but failing to convince his two associates of the rank duplicity of the king, of which he himself was assured by means of the spies in his pay at the Spanish court, and of his perfidious designs against them, he was compelled to leave them to their fate, and retired to his German estates. Hoorn and Egmont were seized and executed; William, cited as a rebel (Jan., 1568), and, on the ground of being a knight of the golden fleece and a sovereign prince, refusing to appear, had his estates confiscated, and the duke of Alva arrived at Brussels, to reduce the provinces to submission. William had hitherto lived in a most luxurious and extravagant manner, the splendor of his household far exceeding that of his royal master; but now he effected a thorough retrenchment, and disposed of his valuables, to equip four armies for the invasion of the Low Countries. Two of the armies failed completely; the third, under his chivalrous brother Louis, was destroyed at Jemmingen by Alva; and the fourth, 30,000 strong, under his own immediate command, lay in Brabant, unable to force Alva's army to a conflict, till want of the means of paying his soldiers forced him to retreat. His next

attempt was made in 1572, and though as unsuccessful on land as before, he succeeded in exciting Holland, Zealand, Gelders, Overyssel, and the bishopric of Utrecht to rise for their liberties; and was proclaimed by these provinces as their stadtholder for the king, whose authority he and they still acknowledged. Meantime, his coadjutors, the "beggars of the sea," had taken Brill and Flushing, and had committed heavy depredations on Spanish commerce. But ere long the fortune of the Spaniards on land was again in the ascendant; fortress after fortress fell into their hands, despite William's utmost efforts to relieve them; and though Holland and Zealand still remained faithful to the cause of liberty, he found it impossible to raise an army which could fairly cope with the enemy. He succeeded, however, by breaking the dykes, in saving Leyden, though Antwerp and Haarlem experienced all the horrors of a siege and capture. It was at this period that William openly professed himself a Calvinist, though, with his usual moderation, he utterly disclaimed the bigoted fanaticism which characterized his co-religionists, and in which they went near to equal their adversaries the Catholics. Success still attended the patriot fleet, and though the gallant Louis, with his brother Henry, was defeated and slain at Mooker-Heide (April 14, 1574), the ruinous condition of the Spanish finances, and the general detestation in which the soldiers of Philip were justly held, helped William to hold his ground. In March, 1575, conferences were opened at Breda between the belligerents, but Philip obstinately refusing to yield an iota, they were broken off; and in October of that year the provinces of Holland and Zealand pronounced Philip's deposition, and gave power to William to choose the country under whose protectorate they were to be placed. Meantime, the rapacity of the Spanish soldiery had roused the fifteen provinces which still remained loyal to Philip, and the league, known as the *Pacification of Ghent* (Oct., 1576), the object of which was to drive out the foreign troops, and establish, at least for a time, toleration in religion, was the consequence. This was a brilliant success for William; and though Don John of Austria, the new governor, tried to dissolve it by the "perpetual edict" (Feb. 12, 1577), in which he granted nearly all demands, William succeeded, by skillful policy, in foiling the attempt. War was accordingly resumed, and the patriots were defeated at Gembloux (Jan. 31, 1578), though their spirits were from time to time buoyed up by an occasional success. The next governor, Alexander Farnese, succeeded, however, in detaching the Walloon provinces from the league, though, to compensate for this, William obtained the signature of the *Union of Utrecht* (Jan. 23, 1579), the first foundation of the Dutch republic. In the following year his two faithful provinces, Holland and Zealand, after having been nominally under the sway of the archduke Matthias of Austria, and of the duke of Anjou, proclaimed William their sole ruler, the duke of Anjou being still acknowledged as sovereign of the others. William, however, after his long and desperate struggle for his country's freedom, was not destined long to enjoy the honors of sovereignty, for, on March 15, 1580, Philip had, by Granvelle's advice, put a price of 25,000 gold crowns on his head, and the incitement of this magnificent bribe produced various attempts to assassinate him, the last of which, by Balthasar Gerard, was successful, at Delft, July 10, 1584. William was four times married, and left by his first wife, Anne of Egmont, Philip-William, prince of Orange; by his second, Anne of Saxony, the famous Maurice (q.v.); and by his fourth, Louise de Coligny, Frederick-Henry, who succeeded Maurice as stadtholder of Holland

William the Silent, as he was called in his day, from his discretion and not from any moroseness of disposition, was tall in stature, and had a dark complexion, brown hair and eyes, and a broad forehead. He was generous and frank, his piety and integrity are unquestioned, and his sagacity, courage, and determined will made him a leader of men. A memorial tower in his honor was erected at Dillenburg in 1875. See *Lives* by Klose (1864), Herrmann (1873), and Motley, *The Rise of the Dutch Republic.*

WILLIAM I. (Frederick Wilhelm), first king of the Netherlands; 1772–1843; b. Brussels; grand-nephew of Frederick the Great. Under the title of Prince of Orange, he commanded the Dutch army till the conquest of his country by France, soon after which he went to Berlin. In 1802 his father, the last stadtholder, gave him the principality of Fulda, with other districts; but they were taken from him in 1806 on account of his refusal to join the Rhenish confederation. Becoming a gen. in the Prussian service, he was captured by the French at Jena. He was soon released, and entered the Austrian service. In accordance with the arrangements made at the congress of Vienna he was declared king of the Netherlands (including Belgium) in 1815; and he exchanged his territories in Germany for the grand-duchy of Luxembourg. Belgium gained its independence by the assistance of France, 1830–32. He abdicated in 1840 in favor of his son William II.

WILLIAM II. (Frederick George Lewis), King of the Netherlands, son of William I., was b. at the Hague, Dec. 6, 1792. In 1795 his father sought an asylum in England, and a few years later went to settle at Berlin. The young prince studied at Berlin and Oxford; and in 1811, joining the army in Portugal, he served on the staff of lord Wellington, to whom he became ajt. and speedily obtained the rank of col. His bravery was conspicuous at Fuentes de Onoro and Ciudad Rodrigo. At Badajoz, the storming column having been repulsed, the young prince met and rallied the retiring troops, leading them anew to the attack, and was the first to spring into the breach.

He took an active part at Salamanca, Vittoria, and the battles of the Pyrenees. On the return of the Orange family to the Netherlands, William I. made him commander of the army. The last campaign of Napoleon brought the prince again into active service, and he gained fresh laurels at Quatre Bras and Waterloo, where he was wounded. The prince of Orange married, Feb. 26, 1816, Anna Paulowna, youngest sister of the emperor Alexander I. of Russia. When the Belgian revolution began, in 1830, he was called again into public life; and, as governor of the loyal districts, tried by concessions to allay the storm, but the provisional government at Brussels was not to be satisfied, and having overstepped the limits of his commission, the prince was recalled. In July he took command of the army, and pushed to the center of Belgium; when, at Louvain his victorious course was interrupted by French intervention, and the Dutch army retired to the north. Having more liberal views than were then common, the prince took little share in state affairs, and spent his life chiefly at Tilburg, as commander of the army of observation. On the abdication of William I. (see NETHERLANDS), the prince of Orange assumed the reigns of government (1840) as William II. The political movements of 1848 were felt in the Netherlands, as in other countries; and the ministerial plans of reform not having satisfied the party of progress, the king announced his willingness to sanction whatever changes in the constitution were thought necessary, and the storm was averted. The new constitution was proclaimed Nov. 3, 1848. William died on Mar. 17, 1849, regretted by all ranks. He was marshal in the British army, and held a multitude of European orders.—See *Het Leven van Willem II.*, door J. J. Abbink; also the same by Bosscha.

WILLIAM III. (ALEXANDER PAUL FREDERICK LEWIS), tne last king of the Netherlands, was b. Feb. 19, 1817, and succeeded to the throne on the death of his father, William II., in 1849. The kingdom has since enjoyed uninterrupted peace; material prosperity has increased, and the public debt has been considerably reduced. William's reign has been chiefly distinguished for undertakings which contribute to the true greatness of a nation. In 1866, Luxemburg and Limburg withdrew from the German confederation, the latter being incorporated with the Netherlands. By his first wife, a Würtemberg princess, W. had two sons, neither of whom survived ; by his second wife, a daughter of the prince of Waldeck, a daughter, the present queen (b. 1880). He died Nov. 23, 1890.

WILLIAM I. (Ger. FRIEDRICH-LUDWIG WILHELM), King of Prussia, and the first emperor of united Germany, was the second son of Frederick William III., and was b. Mar. 22, 1797. He joined the army at an early age, and was engaged in the campaigns of 1813–14 against France. On the accession of his elder brother, Frederick William IV. (q.v.), to the throne in 1840, William became governor of Pomerania, and afterward sat in the Prussian diet, and vigorously supported the absolutist party. In consequence, he was so much disliked by the people that on the outbreak of the revolution in 1848 he had to flee to England; though he returned some months after, and was elected to the national assembly. However, from this time he interfered little in the quarrels between the constitutionalists and absolutists, though he gladly accepted the command of the troops dispatched to put down the rising in Baden; and in Oct., 1857, the king having become incapacitated for business, William was commissioned to act as regent, a commission renewed from time to time till his permanent installation in Oct., 1858. At this time he was very popular in Prussia, owing to his supposed opposition to some of the obnoxious measures of the king's ministers, and to his vigorous advocacy of conjoint action with Britain and France in the war of 1854; and his election as regent was consequently opposed by the aristocratic and pietistic parties, who were, on his elevation, dismissed from power, and a more liberal ministry formed. On Jan. 2, 1861, William ascended the throne; and the occasion of his coronation, Oct. 18, following, he himself put the crown on his head, declaring that he "ruled by the favor of God, and of no one else." The result of the elections to the chamber of deputies, which were being carried on at the same time, being much in favor of the liberal party, William, who was quite astonished at the fact of the party whom he looked upon as the opponents of the crown having a majority, attributed it to the intrigues of secret enemies; and in his address at the opening of the chambers, saying that he "never could permit the progressive development of our inner political life to question or to endanger the rights of the crown and the power of Prussia," disclosed the principle of his policy, a policy which, with all the unflagging perseverance and unconquerable obstinacy which characterize men, like him, of thorough honesty, unflinching firmness, and considerable narrow-mindedness, he afterwards unremittingly pursued. The first chamber which sat after his coronation was dissolved, despite the protest of a large majority of the members; but the succeeding elections further increased the liberal majority; and though some popular measures were brought forward, and some obnoxious taxes abolished, the new chamber proved as refractory as its predecessor, and refused its consent to the extensive changes in the Prussian military system (the king's pet scheme), and to the raising of money by loan, to be applied for that and other ministerial projects, till its constitutional powers were fully acknowledged. On Sept. 22, 1862, Herr von Bismarck-Schönhausen, formerly the ambassador at Paris, was made prime minister; and the deputies having not only rejected the ministerial budget, but resolved that the expenditure of moneys not sanctioned by them was

a breach of the constitution, the chamber was dissolved, Oct. 14, the king declaring by message that as the three estates could not agree, he should continue to do his duty to his people, without regard to "these pieces of paper called constitutions," in which he had no faith. The number of the liberals was further increased in the following year, and the contest continued; the deputies displaying the same firmness and extreme moderation as before; while the king and his ministers made it plainly understood that if the lower chamber did what the government asked it to do, all would be well; but if not, the king would "do his duty" without its aid. However, this strife between the old feudal and the modern liberal doctrines was shelved at the close of 1863, by the able strategy of Bismarck, who revived the old dispute with Denmark regarding its government of Sleswick and Holstein, and by forcing Austria to conjoint action, contrived to make the question one of "German" interest. See SLESWICK. Then came the war (see GERMANY) between Prussia and Austria. William became the head of the North German Confederation in 1867. At Ems, in July, 1870, took place the memorable interviews between William and the French ambassador, Benedetti, which ended in the war of 1870–71. William accompanied the army, and commanded at the decisive battles of Gravelotte and of Sedan. On Jan. 18, 1871, William was proclaimed emperor of Germany in the palace of the French kings at Versailles; and, as if completely to re-habilitate the old imperial title, the ancient enmity between pope and emperor was fully revived by the subsequent educational measures of the German government. In May, 1878, the emperor was twice shot at, being seriously wounded the second time. These attempts were attributed, directly or indirectly, to socialist influence, and led to legislation tending to repress socialism. William married, June 11, 1829, Maria Louisa of Saxe-Weimar, by whom he had issue Frederick William, who reigned as Frederick III. (q.v.); and Louisa, the present grand-duchess of Baden. He died at Berlin, March 9, 1888, and was buried at Charlottenburg.

WILLIAM II. (FRIEDRICH WILHELM VICTOR ALBRECHT VON HOHENZOLLERN), emperor of Germany and king of Prussia, son of Frederick III. and Victoria, princess royal of England, was b. Jan. 27, 1859. After graduation at a university he received a thorough military training, and in 1888 was promoted by his grandfather to the rank of major-general. He ascended the throne in June, 1888, on the death of his father. His public speeches exhibit him as a man of aggressive and impulsive temperament. He married, Feb. 27, 1881, princess Augusta Victoria of Schleswig-Holstein. His eldest son, Frederick William, the present crown prince of Germany, was b. May 6, 1882.

WILLIAM THE SILENT. See WILLIAM, PRINCE OF ORANGE.

WILLIAM AND MARY COLLEGE, at Williamsburg, Va., is, after Harvard, the oldest in the United States, having been chartered by William and Mary in 1693. In 1619 grants of land for a college near Richmond, Va., had been obtained, but the design was frustrated by the Indian massacre of 1622. In 1660 the grants of land were renewed; but not until 1693 was a royal charter and endowment secured. The institution was appointed surveyor-general of Virginia; and by its charter was entitled to a penny a pound on all tobacco exported from Virginia and Maryland. In 1766 these privileges were worth more than $5000 per annum, but the revolution cut them off. Until 1793, also, it shared with Harvard the interest of a fund left for educational purposes by the hon. Robert Boyle. While the institution suffered such losses by the revolution, it was a cordial advocate of it. Itself a result of the revolution of 1688, its students were enthusiastic friends of that of 1776. George Washington, having been examined by it, was made one of its surveyors. Besides the losses suffered in two wars, the college buildings were three times destroyed by fire. Under the auspices of Jefferson it was the first college in the United States to adopt modern methods of study, adding at a very early date to the college course the study of law and the constitutions of the state and the United States, the study of political economy, history, modern Languages, etc. The institution maintained its existence in the midst of obstacles, but from 1881–88 was obliged to close its doors. In 1888, it was reopened with the addition of a normal department, and had, 1890–91, 8 professors, 188 students. President, Hon. Lyon G. Tyler, LL.D.

WILLIAMS, a co. in N. Dakota; on the Missouri river; 1260 sq. m. Pop. '90, 109. Co. seat, Williston.

WILLIAMS, a co. in extreme n.w. Ohio, bordering on Indiana and Michigan; 415 sq.m.; pop. '90, 24,897. Co. seat, Bryan.

WILLIAMS, ALPHEUS STARKEY, 1810–78, b. Conn.; graduated at Yale, 1831, studied law and practiced in Detroit, where he was also for some years, judge of probate, and editor of the *Advertiser*, and, from 1849–53, postmaster. He served as lieut.col. of volunteers in the Mexican war, in 1861 was commissioned brig.gen. of volunteers, and in 1862 took command of the 1st division of Banks's corps. At Cedar Mountain his troops held the field until a third were disabled. Gen. Williams held commands also at Antietam, Fredericksburg, Chancellorsville, and Gettysburg, in the Atlanta campaign and in the march to the sea, where he led the 20th corps. He was U. S. minister at San Salvador, 1866–69.

WILLIAMS, ELEAZAR, 1787–1858, thought to be a grandson of Eunice, daughter of John Williams, the "redeemed captive;" was educated by friends of the family at Long meadow, Mass.; was a secret agent of the United States among the Canadian Indians in the war of 1812; became an Episcopal minister, 1826, and was employed among the In-

dians at Green bay. About 1842 he declared himself the "lost dauphin of France," who had been carried secretly from prison in Paris, and brought to America. This claim was ingeniously advocated by the Rev. J. H. Hanson, in *Putnam's Monthly* (1853), and afterward in a volume entitled, *The Lost Prince.* Those who believed the story thought that he had a decidedly Bourbon countenance; others regarded him as a good looking half-breed Indian.

WILLIAMS, Elisha, 1694–1755, b. Mass.; graduated at Harvard college, 1711; preached at Newington, Conn., then a parish of Wethersfield, 1720–25; was president of Yale college, 1726–39, when he resigned because of ill health; was a member of the legislature and a judge of the superior court; served as chaplain to the Connecticut regiments in the expedition against cape Breton, 1745; was appointed col. of a regiment raised for an expedition against Canada, and went to England to collect the pay due to his men.

WILLIAMS, Ephraim, 1715–55, b. Newton, Mass.; at first a sailor, then a soldier, and a capt. in the colonial forces in the French war. In 1750 he received from the government a grant of 200 acres of land within the limits of the present towns of Williamstown and Adams. Fort Massachusetts was built there, and he was put in command of that, and the other forts w. of the Connecticut river. In 1755 at the head of a regiment sent to re-enforce sir William Johnson, he was ambuscaded near lake George by a force of French and Indians, and killed. Williams college (q.v.), was eventually founded, with property bequeathed by him for a free school.

WILLIAMS, Helen Maria, 1762–1827, b. England; published several volumes of poetry; went to Paris just before the revolution; wrote in favor of the Girondins; and was imprisoned; was released after Robespierre's fall; returned to Paris, 1796; after the peace of Amiens, was again imprisoned. Among her published writings are numerous volumes relating to France and the revolution: translation of *Paul and Viginia;* and the well-known hymn, "While thee I seek, protecting power."

WILLIAMS, James, 1740–80, b. N. C.; settled in South Carolina in 1773, and was a delegate to the provincial congress of that colony in 1775. Four years later he was appointed col. in the state militia. At the battle of Stono the same year, he held a command; and he defeated a combined force of British and loyalists at Musgrove's Mills in 1780. He was killed at the head of one of the attacking columns at the battle of King's mountain.

WILLIAMS, James D. 1808–80, b. Ohio; received only a common school education and became a farmer in Indiana. He was an old school democrat, served many terms in the state legislature as representative and senator, and in 1874 was elected to congress. In 1876 he was the democratic candidate for governor of Indiana, and in a contest unusually exciting from its occurring in the year of presidential elections, defeated his opponent, Benjamin Harrison. He was popular with the working classes, and had a studied plainness in manners and dress.

WILLIAMS, Jesse, 1807—86, b. N. C.; one of the engineers who made the first survey of the Miami and Erie canal, upon whose construction and that of the Ohio canal he was engaged 1824–32. In the latter year he became chief engineer of the Wabash and Erie canal, and in 1837 was made by the state of Indiana chief engineer of all the internal improvements in that state; and he continued to hold that position, with the exception of 5 years, though almost constantly engaged in railroad construction or management. In 1853 he was appointed chief engineer of the Pittsburg and Fort Wayne railroad, of which he soon became a director. He was a government director of the Union Pacific railroad, 1864–69, and was afterward chief engineer of the Grand Rapids and Indiana, and of the Cincinnati, Richmond and Fort Wayne railroads.

WILLIAMS, John, 1582–1650, b. Wales; graduated at Cambridge, 1603, where he was distinguished in a wide range of studies; chaplain to the lord chancellor, 1609, and afterward to James I. with whom he was a favorite; prebendary of Hereford, 1612, of Lincoln, 1613; and of Petersborough, 1616; dean of Salisbury, 1619; and of Westminster, 1620; keeper of the great seal, 1621; bishop of Lincoln, 1621; preached the king's funeral sermon, 1625; offended Charles I.; was condemned after 8 years' proceedings before the star chamber, on the charge of betraying the king's secrets, suspended from his bishopric; fined £18,000; imprisoned in the Tower, 1636–40; released by the long parliament, and restored to his diocese; archbishop of Canterbury, 1641; imprisoned again and released 1643, supported the king during the rebellion.

WILLIAMS, John, 1664–1729; b. Mass.; graduated at Harvard college, 1683; was ordained pastor at Deerfield, Mass., 1688; in 1704, 340 French and Indians broke open his house, killed two of his children and started with him, his wife, 4 children and other prisoners for Canada. On the second day Mrs. Williams, unable to proceed, was killed. In Canada he was treated kindly, and in 1706 was redeemed with two of his children and other captives. He resumed his pastoral charge and published a narrative of his imprisonment the title of which, *The Redeemed Captive,* was popularly applied to himself.

WILLIAMS, John, a celebrated missionary, was born at Tottenham, London, June 29, 1796. At the age of 14, he was apprenticed to an ironmonger, and during his appren

ticeship, displayed a great taste for mechanics, and acquired a knowledge of mechanical arts, which he afterward turned to great account. Having become deeply religious, he offered himself to the London missionary society as a missionary to the South seas. He was ordained in 1816, and sent to Eimeo, one of the Society islands. Two months after his arrival, he was able to preach to the people in their native tongue. From Eimeo, he soon went to Huaheine, and afterward to Raiatea, the largest of the Society group. His labors here were attended with great success; the island became Christian, and the arts and habits of civilization were introduced along with Christianity. Wherever Williams went, he not only preached the gospel, but instructed the people in the arts, so as to elevate them from their state of barbarism. At Raiatea, he heard of Raratonga, the chief of the Hervey islands, and thither he went in 1823. The mission which he founded there was eminently successful; not only Raratonga but the whole group of the Hervey islands being Christianized. In his missionary work, Williams made great use of native teachers, trained by himself. He translated the New Testament into the Raratongan language, and prepared books for the schools which he established. After spending some time in Raratonga, he wished to return to Raiatea; but the island in which he lived lay out of the way of vessels, and he resolved to build one. He made all the necessary tools, and in about 15 weeks completed the vessel itself, a boat 60 ft. long, and 18 wide, the sails of native matting, the cordage of the bark of the *Hibiscus*, the oakum of cocoa-nut husks and banana stumps. In this vessel, during the next four years, he visited many of the South sea islands, extending his missionary labors to the Samoa islands. In 1834 he came to England, where he remained for nearly four years, during which he procured the publication of his Raratongan New Testament by the Bible society, and raised £4,000 for the purchase and outfit of a missionary-ship for Polynesia. In 1838 he returned to the chosen sphere of his labors, visited many of the islands, and finally the New Hebrides, where he hoped to plant a mission, but was killed, Nov. 20, 1839, and most of his body eaten by the savage natives of Erromanga.

WILLIAMS, John, d.d., b. Mass., 1817; graduated Trinity college, 1835; ordained a Protestant Episcopal clergyman, 1841; rector of St. George's church, Schenectady, N. Y., 1842–48; president of Trinity college, Hartford, 1848–53; assistant bishop of Connecticut, 1861; was appointed bishop on the death of Bishop Brownell, 1865. He is the author of *Ancient Hymns of the Holy Church; Thoughts on the Gospel Miracles*; *Inaugural Discourse at Trinity College; Studies in the Book of the Acts;* contributed articles to the *Church Review;* edited Browne's *Exposition of the Thirty-nine Articles.*

WILLIAMS, John J., d.d., b. Boston, 1822; was educated at the Sulpician coll., Montreal, and the sem. of St. Sulpice, Paris. After being ordained he was appointed asst. priest of the Boston Rom. Cath. cathedral, 1845, and was made rector, 1855. He took charge of St. James' parish, 1857; was appointed coadjutor bp. of Boston, 1866; and later was consecrated bp.; made abp. of Boston, 1875.

WILLIAMS, John S., b. Mt. Sterling, Ky., 1820; graduated at Oxford coll., O. 1839; practised law at Paris, Ky.; served in the Mexican and civil wars, holding a brigadier generalship in the confederate service. He was a member of the Ky. legislature, 1857 and 1875; and was elected, as a dem., to the U. S. senate, 1878.

WILLIAMS, Jonathan, 1750–1815, b. Boston; entered business life, several times made voyages to England and the West Indies, and was secretary to Franklin when the latter was ambassador to France. He resided some time in Philadelphia, studied the subject of fortification, and in 1801 became a maj. in the artillery and engineers. By the act of 1802, establishing the West Point academy, maj. Williams was made superintendent of the institute, but resigned in 1803, a question of relative rank having arisen. He was re-appointed with the rank of lieut.col., and made chief engineer. From this time until 1812 he had charge of West Point. He also had charge of the fortifications of New York harbor, and planned Castle Williams (Governor's Island), Fort Columbus and Castle Clinton (afterwards Castle Garden). He was the first to introduce here principles of scientific military engineering and fortification. On the outbreaking of the war of 1812 Col. Williams claimed command of Castle Williams, and on refusal resigned. In 1814 he was elected to congress. He published *Elements of Fortification*, 1801, and other military and scientific works.

WILLIAMS, Sir Monier, b. Bombay, 1819; studied at King's college, London; entered Oxford, 1838; soon obtained an Indian writership, and studied at the East India college, Haileybury, gaining the first prizes in all the oriental subjects; resigned his Indian appointment, returned to Oxford, and graduated, 1844; prof. of Sanskrit at Haileybury, 1844–58; at Cheltenham college, 1858–60; Boden Sanskrit professor at Oxford, 1860; visited India, 1875. He has published *A Practical Grammar of the Sanskrit Language; An English and Sanskrit Dictionary; Original Papers Illustrating the History of the Application of the Roman Alphabet to the Languages of India; Indian Epic Poetry; A Sanskrit and English Dictionary; Indian Wisdom; Hinduism; Modern India and the Indians*, etc.

WILLIAMS, Otho Holland, 1749–1800, b. Md.; lieut. of a rifle company at the beginning of the revolution. In 1776 he became maj. in a rifle regiment, which was part of the garrison of fort Washington, N. Y., upon its capture by the British. Williams resisted gallantly, but was taken prisoner. As soon as he was exchanged he was made col. of the 6th Md. regiment. He was afterward adjt.-gen. in Gate's army in the south, He distinguished himself at the battle of Camden, and in the army under Greene, gaining the day at Eutaw by his charge.

WILLIAMS, Roger, founder of the state of Rhode Island, was born in Wales (some say London) between 1599 and 1603. In his youth he came to London, and attracted the attention of sir Edward Coke by his short-hand notes of sermons and speeches in the star chamber; and was sent by him to Sutton's hospital, now the Charterhouse school, in 1621; matriculated pensioner of Pembroke coll., Cambridge, 1625; took degree bachelor arts, 1626–7. He studied Latin, Greek, Hebrew, French, and Dutch, and was beneficed at High Laver, Essex, it is believed; but he soon became an extreme Puritan, and emigrated to New England, arriving at Boston, Feb. 5, 1631, "a young minister, godly and zealous, with his wife Mary." He refused to join the congregation at Boston because the people would not make public declaration of their repentance for having been in communion with the church of England; he therefore went to Salem as assistant preacher, but was soon in trouble for denying the right of magistrates to punish Sabbath-breaking and other religious offenses, as belonging to the first table of the law. For his opposition to the Mass. bay government, he was banished, and went to Plymouth, where he assisted its minister, and studied Indian dialects. In 1633 he returned to Salem, and was settled over the church, but was opposed by the government for denying its right to take the Indians' lands without purchase, and the right to impose faith and worship. He held that it was not lawful to require a wicked person to swear or pray, which were both forms of worship; and that the power of the civil magistrate extends only to the bodies, goods, and outward state of men, and not to their souls and consciences. Banished from the colony in 1635, and threatened to be sent back to England in order to prevent the infection of his new doctrines from spreading, he escaped in midwinter to the shores of Narragansett bay, accompanied by a few adherents, where he purchased lands of the Indian chiefs, founded the city of Providence, and established a government of pure democracy. Having adopted the belief in adult baptism of believers by immersion, Williams was baptized by a layman, and then baptized him and ten others, and founded the first Baptist church in America. Later, he doubted the validity of this baptism, and withdrew from the church he had founded. In 1643 he went to England to procure a charter for his colony, and published a *Key into the Language of America*, and *The Bloudy Tenent of Persecution for Cause of Conscience Discussed*, etc., his chief work on the nature and sphere of civil government. After returning to Rhode Island, he came a second time to England on business of the colony in 1651, when he published *Experiments of Spiritual Life and Health, and their Preservations*, dedicated to his friend, lady Vane, and written, as he says, "in the thickest of the native Indians of America, in their very wild houses, and by their barbarous fires;" also, *The Hireling Ministry none of Christ's*, and *The Bloody Tenent yet more Bloody by Mr. Cotton's Endeavor to wash it White in the Blood of the Lambe*. At this period he engaged in an experiment of teaching languages by conversation, and made the acquaintance of Milton. He returned to Rhode Island in 1654, and was elected president of the colony; refused to persecute Quakers, but held a controversy with them, and published *George Fox digg'd out of his Burrowes*. By his constant friendship with the Indians, he was of great service to the other colonies; but they refused to remove their ban, or to admit Rhode Island into their league. He died in 1683.—See Memoirs, by Knowles (Boston, 1833); Gammell (Boston, 1846); Dexter's *As to Roger Williams and his so-called "Banishment"* (Boston, 1876); also W.'s biography and works published by the Narragansett club (1866).

WILLIAMS, Rowland, d.d., 1817–70, b. in Wales; graduated Cambridge, 1839; fellow and tutor, 1839–50; vice-principal and prof., Hebrew in the Welsh theological college of St. David's, Lampeter, and chaplain to the bishop of Llandaff; select preacher at Cambridge, 1854; vicar of Broad Chalk, 1859. He was one of the writers of *Essays and Reviews*, was prosecuted in the court of arches and condemned, 1862, but the judgment was reversed, 1864. He published *Rational Godliness; Christianity and Hinduism Compared; Broad Chalk Sermon-Essays on Nature, Mediation, Atonement, Absolution*, etc.; *The Hebrew Prophets; Psalms and Litanies*. See *Life* by his widow (1874).

WILLIAMS, Samuel, ll.d., 1743–1817, b. Mass.; graduated Harvard college, 1761; minister of Bradford, Mass, 1765–80; Hollis prof. of mathematics and natural philosophy, Harvard college, 1780–88; lectured on astronomy and natural philosophy in the university of Vermont; preached at Rutland, Vt., 1789–95, and subsequently two years at Burlington. He surveyed the w. boundary of Massachussetts, 1788, and the boundary line of Vermont, 1805. He published *The Natural and Civil History of Vermont;* was for some time editor and proprietor of *The Rutland Herald;* was fellow of the American academy of arts and sciences; contributed papers on astronomy, etc., to scientific journals.

WILLIAMS, Samuel Wells, ll.d., b. N. Y., 1812; educated at Rensselaer school, Troy. In 1833 he went to Canton, China, as a printer for the American board of missions, and was assistant editor of the *Chinese Repository* for several years. He soon became well versed in both Chinese and Japanese, and translated parts of the Bible into the latter tongue. He published a lesson book and vocabulary on the Chinese, 1842–44; and in 1845 returned to New York, where he published, in 1848, *The Middle Kingdom*, probably the best work extant on Chinese government, geography, education, religion, and social life. Mr. Williams returned to China and was interpreter to Perry's expedition to Japan, 1853–54; was for a short time secretary of the U. S. legation in that country; revisited the United States in 1860; in 1862 was secretary of the Pekin legation, and

in 1875 again returned to this country and accepted a position as lecturer on the Chinese language and literature in Yale coll. He published, in 1856, a *Tonic Dictionary of the Chinese Language in the Canton Dialect*, a new edition of which was published at Hong Kong in 1876, and in 1874 his *Syllabic Dictionary of the Chinese Language*, a work of great philological importance. In 1881 he was elected president of the New York Bible society. He d. 1884.

WILLIAMS, Seth, 1822–66; b. Maine; graduated at West Point, and was appointed to the artillery. He was aid-de-camp to Gen. Patterson during the Mexican war, and was brevetted capt. for his conduct at Cerro Gordo. He was adjutant at West Point, 1850–53. On the outbreak of the civil war he was appointed brig.gen. of volunteers. He was McClellan's adjutant-gen., and in 1864 became active inspector-gen. on Grant's staff. He rose to be maj.gen.

WILLIAMS, Stephen, d.d., 1693–1782; b. Mass.; was carried captive from Deerfield by the Indians to Canada with his father, the Rev. John Williams, and family; redeemed by the French governor and sent to Boston, 1705, followed by the rest of the family, 1706. He wrote soon after a narrative of the captivity; graduated Harvard college, 1713; taught at Hadley, 1713–14; ordained Congregational minister at Longmeadow, 1716; chaplain in sir William Pepperell's regiment against Louisburg, 1745, and in Col. Ephraim Williams's regiment to lake George, 1755; visited the Housatonic Indians at Stockbridge, Mass., and established a mission among them.

WILLIAMS, Thomas, 1815–62; b. New York; graduated at West Point and was appointed to the engineers. After serving in the Florida campaign and on the frontier he became Gen. Scott's aid-de-camp, and went through the Mexican war. He was made brig.gen. of volunteers in 1861, commanded fort Hatteras till the spring of 1862, and was then put at the head of a brigade in the Ship Island expedition. He led the land troops at Vicksburg, June, 1862, and was killed in August defending Baton Rouge, La., against Breckenridge.

WILLIAMS, Thomas Scott, ll.d., 1777–1861; b. Conn.; graduated at Yale, 1794; studied law, and after admission to the bar practiced at Mansfield and Hartford. He was repeatedly a member of the legislature, and was elected to Congress, 1817–19. 1829–47 he was a judge of the Conn. supreme court, and in 1834 was appointed chief-justice, which position he held until 1847. From 1831 to 1835 he was mayor of Hartford. He was president of the American tract society, and left $30,000 for benevolent objects.

WILLIAMS, Rev. William, 1665–1741; b. Mass.; was graduated at Harvard in 1683, his cousin John, "the redeemed captive," being another of the 3 members the class contained. From 1685 to his death he was minister at Hatfield, Mass. A number of his sermons were published, one of which commemorated the half-century of his settlement.

WILLIAMS, William, 1731–1811; b. Conn.; graduated at Harvard college in 1751. Attached to the staff of his relative Col. Ephraim, he fought in the battle of lake George, 1755. Settling as a merchant in Lebanon, Conn., he was for many years town clerk, and frequently represented the town in the legislature. He belonged to the Conn. committee of correspondence, was speaker of the house in 1775, and afterward a member of the council and of the committee of public safety. He was a signer of the declaration of independence in the congress of 1776–77, and was again in congress, 1783–84.

WILLIAMS, William, 1788–1870; b. Conn.; became a gen. of Conn. militia and an eminent shipping merchant; aided in establishing the Norwich free academy by liberal contributions and active service for many years as president of its board of trustees; taught a sabbath-school and maintained religious services among the Mohegan Indians for 17 years; was an active officer of the Seamen's friend society, and a liberal promoter of Bible and missionary societies.

WILLIAMS, Sir William Fenwick; b. Nova Scotia, 1800; became ensign in the royal artillery, 1825. From 1840 to 1843, then being a capt., he served in Turkey, and was brevetted maj. and col. In 1848 he was appointed a commissioner for the settlement of the Turco-Persian boundary, and in 1854 British commissioner with the Turkish army; he was with it when the great victory over the Russians under Mouravieff was won, Sept., 1855. The defense of Kars by Gen. Williams was heroic; and after he was forced to surrender his conduct was rewarded with the rank of k.c.b., a baronetcy, a pension of £200, and from Oxford the degree of d.c.l. From 1856 to 1859 he was a member of parliament, and subsequently in command at Woolwich and in Canada, and governor-general of Gibraltar; retired, 1877. He d. 1883.

WILLIAMS, William R., d.d., b. New York, 1804; graduated at Columbia college, 1822; studied law and practiced it one year; studied theology and entered the ministry in the Baptist church, 1831, becoming pastor of the Amity street church, New York, and continuing there until his death, a period of above 50 years, notwithstanding repeated calls to more conspicuous positions. Dr. W. went three times to Europe and collected there a large and excellent library. Among his published writings, besides many sermons and addresses, are: *Miscellanies; Religious Progress; Christian Character; Lectures on the Lord's Prayer;* and a *History of the Baptists.* He d. 1885.

WILLIAMS COLLEGE, at Williamstown, Berkshire co., Mass., was chartered in 1793. The town and the college were named in honor of Col. Ephraim Williams, who had command of the forts in the Hoosac valley, and was killed in a battle with the French and Indians, Sept. 8, 1755. By his will he established a free school in the township which was to bear his name. The most advanced students in this school became the first college class, numbering 4, and receiving degrees in 1795.

There are 6 buildings used as dormitories, whose names, dates of erection, and cost are as follows: West coll., 1790, $11,700; East coll., 1798 (burnt 1841, rebuilt 1842), $12,400; South coll., 1842, $4000; Kellogg hall, 1847, $5000; College hall, with large dining-rooms, 1872, $10,000; Morgan hall, 1882, $100,000. Total capacity, 242 men. There are 9 Greek-letter fraternity houses, with rooms for 75 men.

There are 7 buildings used for books, cabinets, recitations, etc.: Griffin hall, 1828, $10,000; Lawrence hall, 1846, $7000; Jackson hall, 1856, $4000; Chapel and Alumni hall, 1859, $18,000; Goodrich hall, 1864, $25,000; Clark hall, 1882, $25,000. Thompson chemical laboratory, 1892, $60,000; Thompson physical laboratory, 1893, $60,000; Thompson biological laboratory, 1893, $60,000; College infirmary, $10,000. There are 2 astronomical observatories — the Hopkins, 1838, the first one in this country, $3000, and the Field memorial, 1882, $10,000. For physical training there are the Lasell gymnasium, 1887, $50,000, and the Weston athletic field, $6000. The library has 40,000 books and an endowment of $40,000. The cabinets to illustrate natural science are ample, and the laboratories for chemical and biological work are large and well furnished. The Mark Hopkins memorial building for offices and recitations, 1889, cost nearly $100,000.

The corporate name is, "The President and Trustees of Williams coll." Of the 17 trustees, 5 are elected by the alumni, the others by the body itself. During the hundred years of its history the college has had 6 presidents, 54 professors, and 5319 students, 3075 of whom took the full course. The 22 classes under Dr. Fitch averaged 22 men, the 6 classes under Dr. Moore 15 men, the 15 classes under Dr. Griffin 21 men, the 36 classes under Dr. Hopkins 41 men, the 9 classes under Dr. Chadbourne 34 men, and the 16 classes under Dr. Carter have averaged 59 men, and the faculty now numbers 28 men. The present (1897) number of students is 385. Of the 4000 graduates, 1000 are clergymen, 1000 lawyers, 500 teachers, and 400 physicians.

The 4 years' course of study is strictly collegiate, and the studies are fixed for half that period. 12 studies are offered as electives in junior year and 16 in senior year. The degree of B.A. is given to those who complete the full course. The degrees of M.A. and PH.D. are given on examination, the latter to students in practical astronomy or geodesy.

The college has never been denominational, but its boards of government and of instruction, and the greater number of its students are connected with Congregational and Presbyterian churches. The first foreign missionary society and the first alumni association in this country were formed in this college. The present administration has enjoyed marked financial growth. The annual income is $70,000. President, Franklin Carter, PH. D., LL. D., a graduate of the college in 1862.

WILLIAMSBURG, a co. in e. South Carolina, bounded s.w. by the Santee river; 948 sq.m.; pop. '90, 27,777, chiefly of American birth, includ. colored. Co. seat, Kingstree.

WILLIAMSBURG, city and co. seat of James City co., Va.; near the James river; about 48 m. s.e. of Richmond; the site of William and Mary college, and the Eastern lunatic asylum; pop. '90, 1831. Williamsburg was settled in 1632, being the oldest incorporated town in the state. Before the revolution it was the seat of the provincial government, and, until 1779, the capital of the state. An old Episcopal church, built in 1678, is still in use. When, in 1862, the confederate forces evacuated Yorktown, they fell back on Williamsburg and threw up works about 2 m. e. of the city. The federal forces under Gen. Sumner, consisting of the divisions of Hooker, Kearny, Stoneman, Couch, Smith, and Casey, followed at once, and on May 6 attacked the enemy's position. A stubborn contest ensued, lasting from early morning until night. In this engagement Hooker's division and Hancock's brigade suffered severely. The day was saved by Hancock's feigning to retreat, and, when the enemy followed, ordering a charge which completely routed the part opposed to him. The loss was nearly equal; about 2300 on each side. During the night the confederate Gen. Johnston withdrew.

WILLIAMSBURG, N. Y. See BROOKLYN.

WILLIAMSON, a co. in s. Illinois, drained by the s. fork of Saline river and the Big Muddy in the n.w. portion; 440 sq. m.; pop. '90, 22,226, chiefly of American birth. Co. seat, Marion.

WILLIAMSON, a co. in central Tennessee, having extensive ledges of Trenton limestone, drained by the Harpeth river; 550 sq. m.; '90, 26,321, chiefly of American birth, with colored. Co. seat, Franklin.

WILLIAMSON, a co. in central Texas, drained by the San Gabriel river, and Brushy and Salado creeks; 1070 sq. m.; pop. '90, 25,909, chiefly of American birth, with colored. Co. seat, Georgetown.

WILLIAMSON, HUGH, LL.D., 1735–1819; b. Penn.; graduated in 1757 at the university of Pennsylvania, where he was professor of mathematics, 1760–64. He pursued a course

of medical studies at Edinburgh and Utrecht, and settled as a physician in Philadelphia. When in London in 1773 the privy council summoned him and consulted him in regard to American affairs. Returning to the United States in 1776 he became an army surgeon. He served several terms in congress, and was a member of the convention which drew up the constitution. He settled in New York in 1793. Among his writings is a *History of North Carolina* (1812).

WILLIAMSPORT, a town in Washington co., Md.; on the Potomac river, the Chesapeake and Ohio canal, and the Cumberland valley and the Western Maryland railroads; 6 m. w. of Hagerstown. It has public schools, national bank, electric street railroad, waterworks supplied from the river, flour and saw mills, brick yard, and glove, chair, sash and door factories. It was settled in 1787, and during the civil war became conspicuous from the fact that the confederate army under Lee crossed into Maryland at this point. Pop. '90, 1277.

WILLIAMSPORT, city and co. seat of Lycoming co., Pa.; on the Susquehanna river, and the Beech Creek, the Fall Brook, the Northern Central, the Pennsylvania, and the Philadelphia and Reading railroads; 94 m. n. of Harrisburg. It contains a U. S. government building, Y. M. C. A. building, Dickinson seminary, high school, seminary, public school, and Y. M. C. A. libraries, hospital, home for the friendless, a city park of 40 acres, electric light and street railroad plants, gravity system of waterworks, and national, state, and other banks. The U. S. census of 1890 reported for Williamsport, 302 manufacturing establishments, employing $12,335,423 capital and 6113 persons, paying $2,677,579 for wages and $5,919,284 for materials, and having a combined output valued at $11,107,037. The principal industries are those connected with lumbering, and the manufacture of sewing machines, bicycles, leather, silk, furniture, heaters, and emery wheels. The great Susquehanna lumber boom, which cost over $1,000,000 and has a capacity of 300,000,000 feet of lumber, is located here. Pop. '90, 27,132.

WILLIAMSTOWN, a town in Berkshire co., Mass.; on the Hoosac and Green rivers, and the Fitchburg railroad; 5 m. w. of North Adams. It was incorporated in 1765; contains several villages; is the seat of Williams college (q. v.), and is principally engaged in farming and the manufacture of cotton and woolen goods. Pop. '90, 4221.

WILLIBROD, or **WILBRORD**, Saint, first bishop of Utrecht, and "apostle of the Frisians," claims notice as being one of that meritorious band of British and Irish missionaries by whom Christianity was established in northern Germany. He was b. about the year 658, in the kingdom of Northumbria; and, although educated in the monastery of Ripon, where he received the tonsure, was sent, for final instruction, like most of the monks of that age, to the schools of Ireland. After a sojourn of 13 years in that country, he resolved to devote himself to the conversion of Friesland, in which some of his fellow-monks had already engaged with little success. In 690 he sailed with 12 companions, and passing up the Rhine, arrived at Ultrajectum, the present Utrecht, soon after the victory of Pepin over the Frisians. By Pepin they were warmly received; and Willibrod having established the first beginnings of his mission, went to Rome in 692, whence he returned, with the sanction of the pope, Sergius I., and continued his labor till 695, when he again visited Rome, and received episcopal consecration, together with the pallium of an archbishop. Fixing his see at Utrecht, he converted a large number of the inhabitants, and extended his missionary colonies from that center as far as the Danish provinces; and, although he received some check upon the death of Pepin in 714, yet the successes of Charles Martel enabled him soon afterward to resume, under similar favorable auspices, the work which, after many alternations, ended in the successful establishment of Christianity. Willibrod died at a very advanced age in 738, at the monastery which he had founded at Echternach, near Treves. His festival is Nov. 7. See Bede's *Ecclesiastical History*, chaps. 10 and 11.

WILLIMANTIC, a city in Windham co., Conn.; on the Willimantic and Natchaug rivers, and the Central Vermont, the New England, and the New York, New Haven, and Hartford railroads; 32 m. e. of Hartford. It contains a state normal training school, public and Dunham Hall libraries, high school, national and savings banks, waterworks supplied from the Natchaug river, and electric light plant. The Willimantic river falls 91 feet here, providing unexcelled water power, which is utilized by large manufactories of linen thread, cotton warps, hosiery, print cloth, silk, machinery, paper, carriages, etc. Pop. '90, 8648.

WILLING, Thomas, 1731–1821; b. Philadelphia; educated in England, where he read law in the temple, London, but returned to this country and became a business partner of Robert Morris. The firm were of great assistance to the revolutionary cause in supplying stores, etc., and also financially. See Morris, Robert. Mr. Willing became mayor of Philadelphia, judge of the supreme court, delegate to the continental congress of 1775, and president of the provincial congress of 1774. He was the president of the first bank in the United States.

WILLIS, Nathaniel, 1780–1870; b. Boston; father of Nathaniel P. In 1803 he founded the *Eastern Argus* at Portland, Me., and in 1816 started the first American religious paper, the *Boston Recorder* (since become the *Congregationalist*), with which he

was connected until 1843. From 1827 to 1857 he was the editor of the *Youth's Companion*, still an excellent periodical, of which he was also the founder.

WILLIS, Nathaniel Parker, American author, was b. at Portland, Me., Jan. 20, 1807. His father became the publisher of the *Boston Recorder*, said to be the first religious newspaper ever permanently established. Educated at Yale college, he obtained in 1827 a prize for *Scriptural Poems*. On the completion of his college course, he established the *American Monthly Magazine*, afterward merged in the *New York Mirror*, in which he was associated with George P. Morris. In 1831 he visited Europe, and contributed to the *Mirror* his *Pencillings by the Way*. Appointed *attaché* to the American legation at Paris, he had favorable opportunities for observing European society; and after a visit to Greece and Turkey, returned to England in 1837, and was married to a daughter of a British officer, Gen. Stace. While in England, on account of some personalities in his writings, more consonant to American than English manners, he became involved in a quarrel with Capt. Marryat, which led to a duel. He contributed to the London *New Monthly* his *Inklings of Adventure*, also published in 3 vols.; and in 1839 returned to New York, and published a literary paper, *The Corsair*, and *Letters from under a Bridge*, written at a beautiful country-seat, named, in compliment to his wife, Glenmary. He wrote also at this period *Tortesa the Usurer* and *Bianca Visconti*, dramas, and the descriptions of scenery illustrated in Bartlett's *United States and Canada*. In 1844 he engaged with Gen. Morris in editing the *Daily Mirror*. His wife died, and he revisited Europe, and published *Dashes at Life with a Free Pencil*, 1845; returned to New York in 1846, he was married to a daughter of the Hon. Joseph Grinnell, of Massachusetts, and with his former partner established the *Home Journal*, to which he contributed most of the following works, also published in a collected form: in 1850, *People I have Met*, and *Life Here and There;* 1851, *Hurrygraphs, Memoranda of a Life of Jenny Lind;* 1853, *Fun Jottings, A Health-trip to the Tropics, A Summer Cruise in the Mediterranean;* 1854, *Famous Persons and Places, Out doors at Idlewild;* 1855, *The Rag-bag;* 1856, *Paul Fane, or Parts of a Life else Untold;* 1860, *The Convalescent*. Much of this work was done during a long, brave struggle with what appeared to be consumptive disease. Mr. Willis was an observant and thoughtful writer, discursive, fragmentary, picturesque, sprightly, quaint, and graceful, full of elaborate ease, and ingenious spontaneity. He edited the *Home Journal* (Gen. Morris having died in 1864), and resided at his romantic highland retreat of Idlewild, until his death, Jan. 21, 1867.—His sister is a popular writer, under the *nom de plume* of "Fanny Fern;" and his brother, Richard Willis, is a musician and musical critic.

WILLIS, Richard Storrs, b. Boston, 1819; brother of Nathaniel P. He graduated at Yale college in 1841, and became a writer for the press. He has edited several periodicals in New York, and has written works on music, of which *Church Chorals and Choir Studies* (1854), is perhaps the best known.

WILLIS, Robert, 1800–75; b. London; graduated at Cambridge, 1826, and took orders in the church of England; but is best known as an architect, inventor, and scientist. From 1837 until his death he was professor of natural and experimental philosophy at Cambridge. Among his inventions were the lyophone and odontograph.

WILLIS, Thomas, 1621–75; b. Wiltshire, England; graduated at Oxford, 1639. He fought as a royalist in the revolution, studied medicine during the protectorate, and at the restoration was made Sedleian professor of natural philosophy at Oxford. In 1666 he became physician in ordinary to Charles II. Willis made important medical discoveries concerning the brain, and published two treatises on the subject—*Anatomy of the Brain* (1664); and *Pathology of the Brain and Nervous System* (1667).

WILLIS'S ROOMS. See Almack's.

WILLISTON, Samuel, 1795–1874; b. Mass.; commenced the study of theology, which he relinquished on account of weakness of the eyes, and engaging in business, acquired a large fortune from the manufacture of buttons. He established in Easthampton, Mass., Williston seminary, 1840, to which he gave $270,000, and bequeathed $600,000; endowed two professorships in Amherst college, 1845–47, and gave the college in addition $150,000. He three times erected a church at Easthampton, and was a liberal benefactor to Mount Holyoke female seminary. His total gifts and legacies amounted to $1,500,000.

WILLOUGHBY, Sir Hugh, about 1500–54; b. England; in 1553 made admiral of a fleet of three vessels sent out at the expense of the London merchants with license from Edward VI. "to discover strange countries." The vessels took out 136 persons, of whom 18 were merchants having a share in the expenses of the expedition. In July, 1553, a storm on the coast of Norway dispersed the fleet, which was forced to remain on the coast for some time. Two of them went into the harbor of Arzina, in Lapland, where all the crews and passengers were lost. The third was wrecked, but a few of her crew escaped to Archangel.

WILLOUGHBY LAKE, in Westmore, Orleans co., Vt., is about 7 m. in length, and has great depth. There is a peak of considerable height on each shore. Willoughby mountain, the highest of the two, has many rare plants. The place is a summer resort.

WILLOW, *Salix*, a genus of trees and shrubs of the natural order *salicaceæ*, otherwise regarded as a sub-order of *amentaceæ*. This order or sub-order, to which the poplar (q.v.) also belongs, is distinguished by having the flowers naked or with a cup-like perianth; numerous ovules; a naked, leathery, one-celled, two-valved fruit; seeds with long hairs; leaves with stipules. In the willows, the flowers are absolutely naked, the stamens from one to five in number, the leaves simple and deciduous. There are many species, but their precise number is not likely to be soon determined, as they are very difficult to distinguish botanically, and varieties are very numerous. They are mostly natives of the colder temperate regions of the northern hemisphere, although some are found in warm countries, as *salix tetrasperma* in the hottest parts of India, and another species abundantly on the banks of the Senegal. Most of them are shrubs, and some are of very humble growth, particularly those of arctic and alpine regions. Thus, *S. herbacea*, which is common on the mountains of Scotland, seldom rises more than an inch from the ground. *S. arctica* and *S. polaris* are the most northern woody plants. Other small species are also found to the very limits of perpetual snow in different countries, as *S. Lindleyana* on the Himalaya. Some of the species have already been noticed in the articles Osier and Sallow. Some of those which more generally receive the popular name willow, are trees of large size, and remarkably rapid growth. The wood of some of them, as the White Willow, or Huntingdon Willow (*S. alba*), and the Crack Willow (*S. fragilis*), is used for many purposes, being remarkably durable, especially in damp situations, although light and soft. It was anciently used for shields. Cork-cutters and others employ it for whetting sharp-edged implements. It is very tough. It is used for making paddles of steamboats, because it wears better in water than any other kind of wood. Willows are often planted as ornamental trees, especially near streams and in moist grounds. Many kinds are also planted on the banks of rivers to retain the soil in its place, and restrain the encroachments of the river. They are the better adapted for this purpose that they grow readily by cuttings; and willow-stakes driven into a moist soil strike root, and soon become luxuriant. The twigs of most of the willows are very tough and flexible, and are used by coopers for making hoops, and by gardeners for tying espalier trees, and for many similar purposes. They are much used for basket-making and other kinds of wicker-work. See Osier. Willow withes were probably amongst the first ropes used by man. But the young shoots of many of the kinds with ovate or little elongated leaves are comparatively brittle, and ill adapted for wicker-work. Willow trees are sometimes treated as pollards, and the lop used for fuel and other purposes. They are also often grown as coppice-wood, yielding a great bulk of hoops, poles, fuel, etc. The leaves and young shoots are in some countries used as food for cattle, and even dried and stacked for that use. A fragrant water is distilled in the n. of India, from the catkins of the Egyptian or Caliph Willow (*S. Egyptiaca*). A principle called *salicine* exists in the bark of willows, which has been found efficacious in intermittent fevers, and is sometimes used as a substitute for quinine. It is crystalline and intensely bitter. The flowers of the willow, which in many species appear before the leaves, are much sought after by bees. The male catkins of many species are very beautiful, the prominent anthers being of a fine yellow color, or as in *S. purpurea*, of a rich purple. The Weeping Willow (*S. Babylonica*), (see Weeping Trees), is a very ornamental species, a native of the east, now much planted in America, and on the continent of Europe, on account of its beautiful pendent twigs. What is called Napoleon's Willow is a variety of it.—The white willow or Huntingdon willow is by far the largest species known in America. It attains a height of 80 ft., and grows so rapidly that a cutting has been known to become a tree of 30 ft. in ten years. Its head is much branched and spreading, its leaves narrow elliptical-lanceolate, silky beneath, and sometimes also above. See illus., Hazel, etc., vol. VII.

WILLOW-MOTH, *Caradrina cubicularis*, a species of moth, of which the caterpillars feed upon the grain of wheat, often doing very much mischief. The perfect insect is of a mouse color, and its wings are closed flat upon its back when it is at rest. On the upper wings are three transverse wavy lines and some black dots. The under wings are pearly white, with a slight tinge of brown near the fringe, and brownish nervures. The body is slender, the antennæ thread-like. The whole length, without the antennæ, is rather more than half an inch. The caterpillar varies in color from dull ocherous red to dirty green, with a blackish head, two brown spots on the first segment, a wavy line on each side edged with black. The chrysalis is bright brown. This moth is often abundant in summer in hayfields, gardens, and barn-yards. The caterpillar feeds on grain through the winter, and draws the corn together with a thin silken web in February or March, when about to assume the chrysalis state.

WILLS, William Gorman, 1830–91, playwright, b. in Ireland, studied at Trinity college, Dublin, and became a portrait painter, but soon gave his attention chiefly to literature, writing a number of successful plays, among which may be mentioned *Charles I.* (1872); *Eugene Aram* (1873); *Marie Stuart* (1874); *Nell Gwynne* (1878); *Blackeyed Susan* (1880); *Claudian* (1885); and *A Royal Divorce* (1891).

WILLS, William Henry, 1810–80; b. England; one of the founders of *Punch*. He belonged to the original editorial staff of the London *Daily News*. In 1850, in association with Charles Dickens, he founded *Household Words*, and he afterwards helped to establish *All the Year Round*, from which he retired soon after Dickens's death.

He published collected articles under the title *Old Leaves Gathered from Household Words.*

WILMER, J. P., D.D., 1812–78; b. Alexandria, Va.; d. New Orleans. He graduated at the univ. of Virginia, and at the Prot. Epis. Alexandria seminary. He had charge of two parishes in Va., and later became rector of St. Mark's church, Philadelphia. In 1861 he returned to Va., and became chaplain in the confederate army. He was sent to England to procure bibles for the southern soldiers; but was captured upon his return while attempting to run the blockade; upon his release, re-entered the army; appointed bp. of Louisiana, 1866.

WILMER, RICHARD HOOKER, D.D., b. Alexandria, Va., 1816; graduated at Yale coll., 1836, and at the theol. sem. of Virginia, 1839; was ordained priest in the Prot. Epis. church, 1840; rector of several parishes in Va., and of St. James' church, Wilmington, N. C.; was consecrated bp. of Ala., 1862.

WILMINGTON, city, port of entry, and co. seat of Newcastle co., Delaware; at the junction of the Brandywine and Christiana rivers, and on the Baltimore and Ohio, the Philadelphia, Wilmington, and Baltimore, and the Wilmington and Northern railroads; 27 miles s.w. of Philadelphia. It was settled by Swedes in 1638, incorporated as a borough in 1739, and chartered as a city in 1832. The city contains a U. S. government building, the Delaware, Homœopathic and co. hospitals, the State asylum for the insane, State industrial school for girls, the Ferris reform school, the quarters of the State historical society, high school, free library, Friends' school, the Hebb school, the Old Swedes' church, built in 1698 and still used, and public parks aggregating over 250 acres. There are national, state, and savings banks, safe deposit companies, gas and electric lights, electric street railroads, over 80 churches, waterworks supplied from the Brandywine river, and daily, weekly, and monthly periodicals. The U. S. census of 1890 reported for Wilmington 590 manufacturing establishments, employing $20,585,646 capital and 14,377 persons, paying $7,664,148 for wages and $13,050,152 for materials, and having a combined output valued at $24,568,125. The principal manufactories are morocco leather factories, railroad car and locomotive works, foundries and machine shops, iron and wood shipbuilding yards, iron and steel works, carriage and wagon shops, slaughtering and meat-packing plants, paper and other machinery works, cotton and paper mills, and malt liquors. The foreign commerce of the port in the fiscal year 1896–97 was, imports of merchandise, $113,536; exports, $4,724,644. The coastwise and interstate trade is very large. Pop. '90, 61,431.

WILMINGTON, city, port of entry, and co. seat of New Hanover co., N. C.; on Cape Fear river, and the Atlantic Coast line, the Cape Fear and Yadkin Valley, the Seaboard Air line, the Wilmington, Newbern, and Norfolk, and the Wilmington Sea Coast railroads; 26 miles from the Atlantic ocean, 210 miles n. of Charleston, S. C. It was settled in 1730, incorporated in 1739, and chartered as a city in 1866. The city has a U. S. government building, U. S. marine hospital, an armory, Y. M. C. A. building, the Gregory normal institute, high and grammar schools, gas and electric lights, electric street railroads, waterworks, about 20 churches, national and state banks, public library, and daily, weekly, and monthly periodicals. There are cotton mills and compresses, extensive guano works, car shops, and foundries. Pop. '90, 20,056.

WILMOT, DAVID, 1844–68; b. Penn.; educated at the Bethany academy, and called to the bar. In 1834 he began to practice at Wilkes-Barre, but soon afterward settled in Towanda. He was a prominent democratic politician, and a member of congress, 1845–51. A bill appropriating $2,000,000 to buy Mexican territory having been introduced into congress, Wilmot, Aug. 8, 1846, offered an amendment providing "that as an express and fundamental condition to the acquisition of any territory from the republic of Mexico by the United States, neither slavery nor involuntary servitude shall exist in any part of said territory." This proviso, the "Wilmot proviso," as it was afterward called, passed the house, but not the senate. It was the basis of the free-soil campaign of 1848. Wilmot became a republican; was U. S. senator, 1861–63, and was made a judge of the U. S. court of claims in 1863.

WILNA. See VILNO.

WILSON, a co. in s.e. Kansas, drained by the Verdigris and the Fall rivers; 576 sq. m.; pop. '90, 15,286. Co. seat, Fredonia.

WILSON, a co. in central North Carolina, drained by Moccasin and Contentnea creeks; 355 sq. m.; pop. '90, 18,644. Co. seat, Wilson.

WILSON, a co. in Tennessee, having the Cumberland river for its n. boundary, containing extensive ledges of limestone; 536 sq. m.; pop. '90, 27,148. Co. seat, Lebanon.

WILSON, a co. in central Texas, drained by the San Antonio river; abt. 940 sq. m.; pop. '90, 10,655. Co. seat, Floresville.

WILSON, ALEXANDER, American ornithologist, was b. at Paisley, Scotland, July 6, 1766. He was the son of a weaver, and was apprenticed to the weaving-trade, at which he worked seven years, amusing himself at the same time by writing verses. As soon as he was free he gratified a roving disposition by mounting a peddler's pack, and went to

Edinburgh to take part in a discussion, in which he maintained the poetic claims of Fergusson against Allan Ramsay, and, in the same cause, wrote *The Laurel Disputed, a Poem.* The piece by which he is best remembered, is a droll poem in the Scottish dialect, styled *Watty and Meg.* He also contributed to *The Bee,* and made the acquaintance of Burns. He was prosecuted for a lampoon upon a resident of Paisley, and condemned to a short imprisonment, and to burn the libel with his own hand at the Paisley cross. Determined to leave a country where his genius was unappreciated, he sailed from Belfast for America, and landed at Newcastle, Del., July 14, 1794, with a few borrowed shillings in his pocket, and no acquaintances. He got work with a copper-plate printer in Philadelphia, then with a weaver; traveled as a peddler in New Jersey, where the brilliant plumage of the birds attracted his attention; then engaged as a school-teacher in Pennsylvania, and then walked 800 miles to visit a nephew in New York. Teaching a school once more in New Jersey, he lived near the botanic garden of William Bertram, who was well acquainted with birds, and, stimulated and encouraged in his studies of nature, Wilson resolved to make a collection of all the birds that were to be found in America. In Oct., 1804, he set out on his first excursion, in which he traveled to Niagara Falls, and wrote *The Foresters, a Poem.* In 1805, he learned etching of a Mr. Lawson, from whom he had already learned to draw; and was employed on the American edition of *Rees's Cyclopædia.* He soon prevailed upon the publisher, Bradford, to undertake an American ornithology. In Sept., 1808, he brought out the first volume, but in a style too costly for the tastes and fortunes of the period, so that he obtained only 41 subscribers in the eastern states, and had no better success in the southern. The second volume was, notwithstanding, brought out in 1810. In 1811 he made a canoe voyage down the Ohio, and traveled overland through the lower Mississippi valley, from Nashville to New Orleans, collecting specimens for his third volume. In his eager pursuit of a rare species of bird of which he long wanted a specimen, he swam across a river, and caught cold, which ended in his death, at Philadelphia, Aug. 23, 1813, when he had nearly completed his work—the 8th and 9th volumes being published after his death. It was continued by Charles Lucien Bonaparte, in 4 vols. (1825–33). A monument was erected to his memory in Paisley abbey churchyard in 1874.

WILSON, Allen B., b. N. Y., 1824, and learned the cabinet maker's trade. In 1849, having at that time never seen a sewing machine, he invented one in which the material was carried forward by a feeding-plate. By this means an endless seam could be formed at any curve. This feeding device he greatly improved in 1850 by giving the roughened feeding-plate four motions. He also introduced the rotary hook and stationary bobbin, the special feature of the "Wheeler and Wilson." In the same year he met Nathaniel Wheeler, and with him and other investors, started the Wheeler & Wilson manufacturing co., the works of which are now at Bridgeport, Conn. D. 1888.

WILSON, Alpheus Waters, d.d., b. Baltimore, 1834; educated at Columbian coll., Washington, D. C.; entered the ministry of the Meth. Epis. church, 1853. He was sec. of the board of missions of the Meth. Epis. church, South; and was elected bp., 1882. He is the author of *Missions.*

WILSON, Augusta (Evans), b. Geo., 1835; married L. M. Wilson, of Mobile, Ala., in 1868. She has written several novels, of which *Beulah* (1859), *St. Elmo* (1866), *Infelice* (1875), and *At the Mercy of Tiberius* (1887) may be mentioned.

WILSON, Sir Daniel, ll.d., a distinguished writer on archæological subjects, was b. at Edinburgh in 1816. He was educated at the university of his native city, and was early attracted by antiquarian studies. He had been for some time secretary to the Scottish society of antiquaries, when he was appointed professor of history and English literature in the university of Toronto—an institution of which he has done much to increase the prosperity and usefulness. Among his works are *Memorials of Edinburgh in the Olden Time* (1848; new ed. 1878); *Oliver Cromwell* (1843); *Archæology and Pre-historic Annals of Scotland* (1851; 2d ed. 1863); *Pre-historic Man: Researches into the Origin of Civilization in the Old World and the New* (2 vols. 1862; enlarged and re-written, 3d ed. 1876); *Chatterton* (1869); *Caliban: the Missing Link* (1873); a volume of poems called *Spring Flowers* (1875). He edited the journal of the Canadian institute, of which in 1859 and 1860 he was president. He succeeded Dr. McCaull in the presidency of Toronto univ., 1881. He was knighted in 1888 and died 1892.

WILSON, George, m.d., f.r.s.e., chemist, brother of Daniel, was b. at Edinburgh in 1818. In 1840, after studying in various laboratories, and graduating in medicine at Edinburgh, he received a license as lecturer on chemistry from the royal college of surgeons in that metropolis. He subsequently became lecturer on chemistry in the school of arts, and in the veterinary college; and in 1855 he was appointed professor of technology in Edinburgh university. In conjunction with this office he held the curatorship of the Industrial museum, an institution which owes much of its completeness and order to his knowledge and skill. Professor Wilson, who had long struggled with ill-health, died in 1859. Among his scientific works mention may be made of his *Text-book on Chemistry* in Chambers's *Educational Course, Researches in Color-blindness,* and *The Five Gateways of Knowledge.* Other works are the *Life of Cavendish* (1851); the

Life of Dr. John Reid (1852); and, along with Mr. Geikie, the *Memoir of Edward Forbes* (1861). There are also several poems from his pen. A memoir of Wilson, illustrating his singularly attractive character, was published by his sister (Mrs. Sime) in 1860

WILSON, HENRY (legally assumed name of Jeremiah Jones Colbaith), vice-president of the United States; b. Farmington, N. H., 1812; d. Washington, 1875. A shoemaker by trade, he represented Natick, Mass., in the state legislature and senate; aided in forming the Free Soil and Republican parties; elected to United States senate, 1853; raised the 22d Mass. regiment, 1861, and was for a time its colonel; re-elected to senate, 1865; became vice-president on ticket with Grant, 1872; author of *History of the Rise and Progress of the Slave Power in America* (1874–77), etc.

WILSON, HORACE HAYMAN, a distinguished Sanskrit scholar, was b. in London, in the year 1786, and was educated for the medical profession. In 1808 he went to India as assistant-surgeon on the Bengal establishment, and in a short time afterward, on account of his proficiency in chemistry, obtained an appointment in the Calcutta mint as assistant to Dr. Leyden. He now applied himself diligently to the study of Sanskrit, and in a few years obtained so high a reputation for his scholarship, that, upon the decease of Dr. Hunter in 1811, Wilson was appointed to succeed him as secretary of the Asiatic society of Bengal, on the recommendation of Mr. H. T. Colebrook. In 1813, Wilson published his first work, viz., *The Mégha Dúta, or Cloud Messenger, a Poem in the Sanskrit Language, by Kálidása; translated into English Verse, with Notes and Illustrations, by H. H. Wilson.* This work, originally published at Calcutta in 1813, was reprinted in London in the following year. His next publication was *A Dictionary, Sanskrit and English, translated, amended, and enlarged from an original compilation prepared by Learned Natives* (Calcutta, 1819–40). This work proved to be of great advantage to students of Sanskrit, and added considerably to Wilson's reputation. His works have been published in a collective edition of 12 vols. (1864–70). Among them as written, edited, or translated by him are: *Select Specimens of the Theatre of the Hindus, translated from the Original Sanskrit,* 3 vols. (Calcutta, 1827); *The Raghu Vansa, or race of Raghu, a Historical Poem, by Kálidása, with a Prose Interpretation of the Text, by Pundits of the Sanskrit College of Calcutta* (1832), edited by Wilson; *The Vishn'u-Purán'a, a system of Hindu Mythology, translated from the Original Sanksrit, and illustrated by Notes* (Lond. 1840); *An Introduction to the Grammar of the Sanskrit Language* (Lond. 1841); *Ariana Antiqua, a Descriptive Account of the Antiquities and Coins of Afghanistan* (Lond. 1841); *History of British India from* 1805 *to* 1835 (1848); *Rig-Veda-Sanhita* (1850); *A Glossary of Judicial and Revenue Terms, from the Arabic, Persian, Hindustani, etc.* (1855). Many of these works were produced while Wilson held the office of assay-master and secretary of the mint at Calcutta. In his official capacity, he often received the thanks of the government of India for reforms in the coinage and other services. He became professor of Sanskrit in Oxford in 1832, and died in 1860.

WILSON, JAMES, LL.D., 1742–98; b. Scotland; educated at Glasgow, St. Andrew's, and Edinburgh universities; emigrated to America; studied law and practiced in Reading, Penn., and Annapolis, Md. In 1778 he settled in Philadelphia. He was prominent in the discussions preceding the revolution, was a member of the congress of 1775 and strongly advocated independence. He was also a delegate in 1783 and 1786, and a member of the constitutional convention of 1787. In 1789 he was made a judge of the U. S. supreme court, and in 1790 became law professor in the university of Pennsylvania. He published with Thos. McKean, *Commentaries on the U. S. Constitution.*

WILSON, JAMES, 1795–1856; b. Scotland; the brother of John ("Christopher North"). He studied law, traveled several years on the continent, and settled near Edinburgh, where he spent the rest of his life. He had an extensive knowledge of natural history, and published several books on various branches of the subject. He also contributed many articles to *Blackwood's Magazine* and the quarterlies, and wrote the articles on natural history and zoology in the *Encyclopædia Britannica.* In 1859 Dr. James Hamilton published his *Memoirs.*

WILSON, JAMES F., b. Newark, O., 1828; studied law and commenced practice in Iowa; was a member of the state constitutional convention, 1856, and of the state legislature, 1857–61, serving the last year as pres. of the senate; was elected, as a repub., to congress; was elected to the U. S. senate, 1883. He died in 1895.

WILSON, JAMES GRANT, b. Edinburgh, 1832; emigrated in 1833 to the United States, and was associated with his father in the publishing business at Chicago. He served in the war of the secession, being made brig.-gen., and has since lived in New York. Among his works are *Illinois Officers in the Rebellion; Life and Letters of Fitz-Greene Halleck; Poets and Poetry of Scotland; Sketches of Illustrious Soldiers;* and a *Biography of Bryant,* prefixed to the memorial edition (1880) of the latter's *Family Library of Poetry and Song; Personal Recollections of the Rebellion;* and *The World's Largest Libraries* (1894).

WILSON, JAMES HARRISON, b. Ill., 1837; graduated at West Point, 1860, and was commissioned in the topographical engineers. He served at fort Pulaski and Port Royal; with McClellan at South Mountain and Antietam; at Vicksburg; through the Wilderness and Shenandoah campaigns, and elsewhere. In 1865 he commanded several cavalry expeditions into Georgia and Alabama, and captured Selma, Montgomery, Columbus, and Macon. Jefferson Davis was captured by troops under his command.

He was rapidly promoted, and left the army in 1870 with the brevet rank of maj.-gen. He has since engaged in railroad management, having been president of the New York and New England railroad, 1880–83. He has written a life of Gen. Grant and a work on China.

WILSON, JOHN, 1588–1667; b. England; studied at Eton, 1598–1602; graduated, Cambridge, 1606; obtained a fellowship; studied law three years; was ordained in the church of England; chaplain to lady Scudamore; preached at Mortlake, Henley, Bumsted, Stoke, and Candish; minister of Sudbury, Essex, but was repeatedly suspended by the bishop's court; embarked for America, 1630, at the Isle of Wight, with Winthrop and others of the Massachusetts colony, and landed at Salem, Mass. At Charlestown he organized a church consisting of himself, Governor Winthrop, Isaac Johnson, and Deputy-Governor Thomas Dudley, which afterwards became the First church of Boston; was ordained teacher in this church by the imposition of the hands of the members; ordained as its pastor, 1632. In 1634 he visited England, returning with his wife, and the renowned Hugh Peters who was compelled to leave for non-conformity. With Governor Winthrop, Wilson opposed the antinomian sentiments of John Wheelwright and Ann Hutchinson. He was chaplain to the troops sent against the Pequot Indians of Connecticut, 1636; was associated with John Eliot in his missionary labors among the Indians. He was distinguished for his benevolence and zeal. He published in England *Some Helps to Faith.* In America, *A Latin Poem to the Memory of John Harvard; The Day Breaking, if not the Sun Rising, of the Gospel,* relative to the Indians in New England.

WILSON, JOHN, famous as Prof. Wilson, and the Christopher North of *Blackwood's Magazine,* was b. on May 18, 1785, at Paisley, where his father was a wealthy manufacturer. His earlier education he received in the house of Dr. M'Letchie, minister of the parish of Mearns, a wild moorland district in Renfrewshire, his boyish residence, which he long afterward commemorated in some of his most charming essays. After having been transferred for a time to the care of the Rev. Joseph Macintyre of Glenorchy, in the Highlands, the love of which became for him a lifelong passion, he was sent to the university of Glasgow, where he remained for 4 years, distinguished as on the whole a diligent and successful, though somewhat fitful and irregular, student. In 1803 he went to Magdalen college, Oxford, where he became notable at once for the splendor of his intellectual gifts, and for his supremacy in the various athletic sports—boxing, rowing, running, etc.—which have always formed a not inconsiderable part of the education bestowed at the English universities. In 1806 he signalized himself by his Newdigate prize poem, *On the Study of Greek and Roman Architecture;* and the year after he took his degree of B.A., that of M.A. following in 1810. Meantime, he had left Oxford and settled himself in Cumberland, attracted partly by the beauty of the lake country and partly by a desire to cultivate the intimacy of Wordsworth, of whose genius he was already a devout admirer. He purchased the lovely little property of Elleray, where, for some years, he resided almost constantly. Besides Wordsworth, there were available in the district for intellectual converse De Quincey, Southey, and Coleridge (to whose *Friend* he contributed some essays). With all of them he became intimate; and when he wearied a little of "celestial colloquy divine" with them, he sought a variety to life in measuring his strength against that of the far-famed Cumberland wrestlers, the very sturdiest of whom has left it on express record that he found him "a vera bad un to lick." In 1810 he married a Miss Jane Penny, a Liverpool lady, of great personal attractions and much amiability of character, in his union with whom he found the main happiness of his life. He now seriously devoted himself to poetry, and in 1812 published his *Isle of Palms,* which attracted considerable attention, and was followed, in 1816, by *The City of the Plague.* This work showed a marked increase of power; but it is questionable, despite the grace, music, and tender feeling of much of his verse, whether, as a poet, Wilson would ever have succeeded in developing the real force of his genuis. His true field, however, was found on the starting, in 1817, of *Blackwood's Magazine.* Some years previously a pecuniary disaster had befallen him; the fortune of £30,000 left him by his father being so seriously curtailed by the misconduct of a relative as to necessitate the breaking up of his establishment at Elleray. On this he transferred himself to Edinburg, where, in 1815, he was called to the Scottish bar; but it does not appear that he had any opportunity of practice. As one of the briefless, with plenty of spare time on his hands, along with his friend Lockhart, then in similar case, he lost no time in proffering his aid to Mr. Blackwood. The astute publisher was at no loss to estimate the value of their alliance; and it is not too much to say that during its earlier years, Lockhart and Wilson were the soul of the success of the magazine. Presently, Lockhart was withdrawn to succeed Gifford as editor of the *Quarterly Review* in London; and Wilson, though never in any strict sense its editor—Blackwood himself throughout exercising a severe control—became, in the eye of the public, more and more identified with the magazine; in a certain modified, yet very real sense, to all intents for many years he *was* editor of the magazine, and under his famous pseudonym of Kit North, swayed it before the world. In 1820 he was appointed to succeed Dr. Brown, deceased, as professor of moral philosophy in the university of Edinburgh, his friend, sir W. Hamilton, being one of the defeated candidates. His real claims to such a post, though not to be compared with those of Hamilton—who, at that time, however, had given little or no

proof before the public of his consummate accomplishment and ability—have been somewhat unduly depreciated. They were not so by Hamilton himself, whose opinion it was, as reported by Mr. De Quincey, that "Wilson's philosophic subtlety of intellect was not the least wonderful of his many wonderful gifts." Thus much is certain, that as a professor, though somewhat desultory in his methods, he had an almost unexampled power of stimulating the enthusiasm of his students. Out of his class-room, however, it must be admitted he but indifferently succeeded in attaining the staid ideal proper to the learned and respectable class of men with whom he was thus somewhat oddly associated. He was the most "muscular" of "Christians," and on more than one occasion the singular spectacle was exhibited of a Scotch professor of moral science taking off his coat in a public market-place to inflict personal chastisement on some ruffian, whose obnoxious proceedings had done outrage to his nicer sense of the fitness of things. Though sedulous and strict in his discharge of his duties as a professor, Wilson was loyal in his adhesion to Blackwood, and his contributions to the magazine, in their mere amount enormous, continued to form the main part of his activity. In 1840 he suffered an irreparable loss in the death of his wife. His grief for a while nearly prostrated him, and seems to have flung something of a shadow over what of life remained to him. He continued, however, to contribute to *Blackwood*, though now somewhat more intermittently; and in 1842 he published, as *The Recreations of Christopher North*, a selection, in two volumes, from the mass of his essays furnished to it. During the session 1852–53, he was smitten by an attack of paralysis, which permanently incapacitated him for the discharge of professorial duty; and in Edinburgh, on April 3, 1854, he died. During his last years he enjoyed a pension of £200 a year from government, in acknowledgment of his literary services. Besides his poetry and periodical writings, he published, in 1822, a volume of sketches, entitled *Lights and Shadows of Scottish Life*, which was followed the year after by his tale of *Margaret Lyndsay*. In these, as in his poems, the robuster side of his mind is scarcely, if at all, represented; but the tender idyllic grace and charm by which they are pervaded, secured for them an extensive popularity, some portion of which they have since continued to retain. In his miscellaneous prose essays, critical and descriptive, and most especially in the celebrated series of dialogues entitled *Noctes Ambrosianæ*, the true power of his genius is revealed. Of the genius, there can be little question; though as to whether it has succeeded in embodying itself in forms which are likely to be permanent, there may reasonably be difference of opinion. The materials for judgment are before the world in the collected (or rather selected) edition of his miscellanies, published since his death by his son-in-law, Prof. Ferrier. As a magnificent *potentiality*, it is scarcely exaggeration to speak of Wilson along with Burns and Scott as a member of the trinity (so to speak) of Scottish literary genius. Certain it is, that nearly as effectually as they did, he stormed the heart of the Scottish people, and became, in his later years—the great novelist being gone—their idol and accepted literary representative. If he has left behind him no work sacred as his literary *monument*, thus much was almost involved in the conditions under which he wrote. Writing, as he did, from month to month, for the instant purpose of the hour, wise and steady concentration of his energies became more and more difficult for him. Not the less, when all reasonable deduction is made, he holds his place as one of the most notable literary figures in the earlier half of this century. His *range* of power is extraordinary; from the nicest subtleties of feminine tenderness, he passes at will to the wildest animal riot and the most daring grotesqueries of humor; and in what he terms "numerous prose," the prose poem or rhapsody—a questionable and perilous, though, within wise limits, a legitimate form of art—he may be held, in his finer passages, to be at this day unrivaled. See the affectionate and felicitous *Memoir* by his daughter, Mrs. Gordon (1863). A selection from the *Noctes Ambrosianæ—Comedy of the Noctes Ambrosianæ*—by J. Skelton, appeared in 1876.

WILSON, Rev. John, D.D., F.R.S., missionary, orientalist, and for many years one of the most influential Englishmen in Bombay, was born at Lauder, in Berwickshire, Dec. 11, 1804. Educated at Edinburgh university, he went in 1828 to Bombay as a missionary; and as a missionary—from 1843 onward in connection with the Free church of Scotland—he continued to labor zealously till his death, Dec. 1, 1875. But his early and thorough mastery of the languages of western India, his vast and scholarly command of the literature, the history, the faiths, and the social usages of the races of India, combined with his indomitable energy, practical sense, and insight into and sympathy with native feeling, enabled Wilson soon and long to exercise a wide and powerful influence usually denied to the missionary. He organized and extended the Scottish missions in western India; he promoted education, legal reform, the spread of toleration, and philanthropic movements of every kind; and was repeatedly trusted as a valued political adviser of the governor and governor-general, especially during the crisis of 1857. His linguistic labors, especially in Zend, were very memorable; and as a man Wilson was loved by all classes and races in the community. He was twice president of the Bombay branch of the Asiatic society, was vice-chancellor of the Bombay university, and a F.R.S. Among his writings other than those connected with his missionary work may be mentioned *The Parsi Religion* (1843); *The Lands of the Bible* (1847); and *India Three Thousand Years Ago.*

WILSON, JOHN LEIGHTON, D.D., b. S. C., 1809; graduated Union college, 1829; studied theology at the seminary, Columbia, S. C.; sailed as a missionary of the American board for Africa, 1833; was stationed eight years at cape Palmas, and twelve at Gaboon; reduced to writing the Grebo and Mpongwe languages; translated portions of the Bible, and prepared grammars and dictionaries; returned to the United States, and was elected one of the secretaries of the southern Presbyterian board of foreign missions. He has published *Western Africa, its History, Condition, and Prospects; The Agency devolving on White Men in Missions to Western Africa; The British Squadron on the Coast of Africa.* He died 1886.

WILSON, PETER, LL.D., 1746–1825, b. Scotland; educated at Aberdeen university. He came to the United States in 1763, and during the next 25 years was principal of academies at Hackensack, N. J., and Flatbush, L. I. He was an ardent patriot during the revolution, and served in the New Jersey legislature, 1778–83. He was professor of Greek and Latin in Columbia college, 1789–1792; published editions of the Greek Testament, and of Adams's *Antiquities;* and an *Introduction to Greek Prosody* (1811).

WILSON, RICHARD, an English landscape painter of eminence, was born in 1714 at Pinegas in Montgomeryshire. He at first devoted himself to portrait painting; but while studying in Italy in 1749 was advised to forsake portrait for landscape. To landscape painting he now exclusively devoted himself; and before returning to England in 1755, he had succeeded at Rome in establishing a considerable reputation. In London, in 1760, he exhibited his great picture, the "Niobe," and at once secured rank as one of the first painters of his time. Another celebrated work was his "View of Rome from the Villa Madama." Failing, however, to hit the general taste, he fell into the hands of the picture-dealers; and so straitened did he frequently find himself, that in 1770 he was happy to obtain the appointment of librarian of the Royal academy. By the death of a brother, who left him a large sum of money, he was rescued from indigence, and retiring to Llamberris in Denbighshire, he died there some few years after in 1782. Of his numerous pictures, now much prized, many are familiar to the public by engravings; in the National gallery, three very fine specimens of him may be found; and several others form part of the well-known Vernon collection.

WILSON, General Sir ROBERT THOMAS, was born in the year 1777 in London, where his father was a painter. He was educated at Westminster, and afterward at Winchester, and when scarcely 17 he joined the 15th light dragoons, then serving under the duke of York in Belgium, and took part in some sharp service, in which the regiment greatly distinguished itself. Shortly after his return to England, he was married to a lady of great beauty and some fortune, to whom, through life, he seems to have been ardently attached. In 1798, he was engaged in Ireland in the suppression of the rebellion; and the year after, he served in the unfortunate campaign of the Helder, and was present with his old regiment at the battle of Egmont-op-Zee. That in everything he proved himself a capable officer, may be inferred from his appointment soon after to command the small force of cavalry which served under sir Ralph Abercromby in Egypt. Here he formed a warm friendship with Gen., afterwards Lord Hutchinson, who succeeded to the command of the army after the death of Abercromby. His next service was at the conquest of the cape of Good Hope in Jan., 1806, where again he commanded a small cavalry force. In the latter part of that year he went abroad on the staff of his friend, lord Hutchinson, who was sent on a mission to the king of Prussia, then a fugitive from his capital, and awaiting the result of the conflict pending between Napoleon and his allies, the Russians. Wilson had now, for the first time, an opportunity of seeing war on a really gigantic scale, being present at the desperate battle of Eylau (q.v.). The peace of Tilsit ensued, and Wilson thereupon returned to England. The struggle in the peninsula had now commenced, and Wilson was sent to take part in it; he was active in the embodiment and training of the Portuguese army, and subsequently, under Wellington, he commanded a Spanish brigade at the battle of Talavera. From this field of action he was, however, withdrawn; and in 1812, he was attached to the Russian army as English military commissioner. During the tremendous struggle which resulted in the capture of Moscow, and the operations which followed in pursuit of the doomed French army, he rendered important service both in council and in the battle-field; and he seems to have won the especial regard and confidence of the emperor Alexander. Throughout the subsequent campaigns in Germany, and those which followed in France, ending with the capture of Paris in 1814, he was present in a similar capacity in the camp of the allies. At Lützen, he took command of the Prussian reserve, and at a particular crisis of the battle, succeeded in severely checking the enemy. At Bautzen, he also distinguished himself; and a day or two after, the emperor of Russia presented to him publicly the cross of the order of St. George, saying that he gave it "as a memorial of his esteem for his courage, zeal, talent, and fidelity to my service." His services during this period will be found noted in every military history of the time; and they amply prove him to have been a most gallant and accomplished soldier.

After the peace, he became involved in the unfortunate matter of queen Caroline and for his censure of the course pursued by government he was dismissed the army. He was afterward, however, re-instated. In 1841, he attained the rank of gen.; and

from 1842 to 1849 he held the post of governor of Gibraltar. In 1818, he had been returned to parliament in the liberal interest for Southwark, and he retained his seat till 1831. On May 9, 1849, having just returned from Gibraltar, he died suddenly in London. During his life he published several works; in 1804, *An Inquiry into the Military Force of the British Empire;* in 1811, *Campaigns in Poland, with Remarks on the Russian Army;* and in 1817, a *Sketch of the Military Power of Russia.* During his foreign campaigns, he kept copious private diaries; and of these, two most interesting volumes, "edited by his nephew and son-in-law, the Rev. Herbert Randolph, M.A.," were some years since published by Murray of London, who also brought out a life of him.

WILSON, Theodore D., b. N. Y., 1840; became a shipwright and carpenter in the navy; and in 1863 was made inspector of the building and repairing of vessels about New York city. In 1866 he was appointed assistant naval constructor, and served in the Pensacola, Washington, and Philadelphia navy yards. He was afterward instructor in naval architecture and ship-building at the Annapolis academy, and in 1873 was promoted to be naval constructor; in 1886, became chief naval constructor, but resigned 1893. He has written *Ship-building, Theoretical and Practical,* a standard text-book.

WILSON, Sir Thomas, LL.D., 1524–81; b. England; educated at Eton and Cambridge, and took orders in the church of England. He was tutor to the sons of the duke of Norfolk by Mary ex-queen of France, and wrote their lives. He left England in 1553, and was confined in the prison of the inquisition till 1555. He returned to England when Elizabeth came to the throne, and became her private secretary in 1558. He was made ambassador to the Netherlands in 1576; became a secretary of state the next year; and dean of Durham in 1579. Among his works are: *The Arte of Rhetorike for the Use of all Suche as are Studious of Eloquence* (1553), one of the earliest English treatises on rhetoric; and *A Discourse upon Usury* (1572).

WILSON, William Dexter, D.D., LL.D., L.H.D.; b. N. H., 1816; entered the theological department of Harvard university, 1835; was ordained in the Protestant Episcopal church, 1842; published a volume whose final title, adopted on its republication in 1846, is *A Manual of Church Principles;* published several works on *Church Government and History,* 1847–49; made professor of history and of philosophy, intellectual and moral, in Geneva College, 1850; and of the last-named branches in Cornell University, 1868–86; and soon after published *Lectures on Psychology;* followed by volumes on *Metaphysics* and *Political Economy* (1872); is the author of several monographs on mathematical and metaphysical topics, and of a history of philosophy. In his philosophy he pursues a line of thought between the two old schools of idealism and sensationalism, accounting for the element of knowledge in dispute between them by maintaining an *insight* into the nature of the things known. He regards logic as a science of things, of which words are only representatives.

WILSON, William L., statesman, was born in Virginia, May 3, 1843, was educated at the Columbian University, Washington, and the University of Virginia, and after finishing his studies in 1861, served in the Confederate army. After the war he practised law, and took part in national politics, being a delegate to the National Democratic Convention in 1880 and elector-at-large in the same year. In 1882 he was made President of West Virginia University, but in the following year, being elected a member of the Forty-eighth Congress, resigned the presidency. He was elected to Congress continuously till November, 1894, and in the Fifty-third Congress, as Chairman of the Ways and Means Committee, framed the so-called Wilson tariff-bill, which with some modifications became a law August 27, 1894. Mr. Wilson is a statesman of unusual intellectual power, scholarly, dignified, with an attractive personality and a gift of persuasive and eloquent speech. In March, 1895, he became Postmaster-General.

WILSON, Woodrow, LL.D., was born in Staunton, Virginia, December 28, 1856. He graduated from Princeton in 1879, and in law from the University of Virginia in 1881. He practised law until 1883, when he entered the Johns Hopkins University as a student of history and politics, and graduated in 1885. He was associate Prof. of history at Bryn Mawr, 1885–88, and Prof. in Wesleyan, 1888–90. Since then, he has been Prof. of Jurisprudence and Political Economy at Princeton. He is author of *Congressional Government: A Study in American Politics* (Boston, 1885); and *The State: Elements of History and Practical Politics* (1889); *Division and Reunion* (1893); *An Old Master and Other Political Essays* (1894); *George Washington* (1896). He is a contributor also to many leading monthly publications.

WILTON, a market t. and parliamentary borough in Wiltshire, at the junction of the Nadder and Wily, affluents of the Avon, 3 m. w.n.w. of Salisbury. The new church, a magnificent Romanesque edifice, decorated in the richest and most tasteful manner, was erected in 1844 by the right hon. Sidney Herbert. The principal industry of the town is the manufacture of carpets, especially Axminsters, and the carpets called Saxony, made of short staple wool. Pop. '91, 2120.

WILTSHIRE, or Wilts, called by the Anglo-Saxons *Wiltonshire,* from their capital town, Wilton (q.v.), one of the south-western counties of England, bounded on the w. and n. by Somerset and Gloucester, and on the e. and s. by Berks, Hants, and Dorsetshire. Area, 1375 sq. m.; pop. '91, 264,997. The county is divided into two unequal parts—the plains in the n., and the hill district, which comprehends the greater part of south Wiltshire; and the separation between these two parts is very nearly that of the

main line of the Great Western railway, the course of which across the county is from n.e. to s.w., past Swindon and Chippenham. The plains incline n. to the basin of the Thames, which forms in part the northern boundary, and are noted for their agricultural capabilities. The surface of this district is checkered with corn-fields and rich pastures, and here the cheeses for which Wiltshire is favorably known are produced. Inkpen Beacon, 1011 ft. high, at the junction of Wiltshire, Hampshire, and Berkshire, is the nucleus whence proceed the North and South downs of Surrey and Sussex, and the hills which, running s. through this county, become the North and South downs of Dorsetshire. Agriculture is carried on with the assistance of modern improvements; many swine are reared, and Wiltshire bacon is famous. Portland stone is quarried at Swindon, Tisbury, and in other localities; and a fine oolite, known as Bath stone, is extensively worked at Box and the neighborhood; and a stone called forest marble yields coarse tiles and flagstones, and often retains in perfect preservation "the ripple-marks of waves and the footprints of crustaceans." The manufacture of woven goods, carpets, and other woolen goods, silks and linens, is carried on at Trowbridge, Wilton, Bradford, Devizes, Westbury, etc. There are iron mines and blast furnaces at Westbury and Seend, and Swindon is one of the greatest railway workshops in the kingdom.

WIMBLEDON, a town in the county of Surrey, England, 4½ m. s.e. of Richmond, about 8 m. s.w. of St. Paul's, London, on several railways. It belongs to the police district of London. Its population consists largely of people who do business in that city, and the town contains many fine residences, and a fine common covering 628 acres. Pop. '81, 15,947; '91, 25,758; parliamentary division, about 69,200.

WIMPFFEN, Emanuel Félix de, b. Laon, France, 1811; entered the army and distinguished himself in the Algerian wars. In 1855 he was made brig.-gen. of the imperial guard, and in 1859 gen. of division. He was commandant at Lyons, and later governor of Algiers and Oran. In the Franco-Prussian war he was at the head of the 12th and 5th army corps, took the chief command at Sedan after MacMahon was wounded, and signed the capitulation. After the war he resided in Algiers. He pub. *Sedan; Réponse au Général Ducrot; La Nation Armée*, etc. D. 1884.

WINANS, Ross, 1797–1877; b. N. J.; d. Baltimore; was the first to build light wheel cars; also invented the "camel-back" engine. He made the larger part of his great wealth in building railroads in Russia. He was the author of *One Religion, Many Creeds* (1870).

WINCH (Anglo-Saxon, *Wince*). A bar, having a handle projecting from one end, which is made to act like a lever, by being fixed at the opposite end to the axis of a machine, to give it motion, as in the grindstone, windlass, etc. An axle turned by a crank handle for raising weights, as from mines, the hold of a ship and the like; also a wincing machine (q. v.).

WINCHELL, Alexander, ll. d., b. N. Y., 1824; educated at Wesleyan university. He was appointed professor of physics and civil engineering at Michigan university in 1853, and held the chair of geology, zoology, and botany at the same institution, 1855–73, when he was elected chancellor of the Syracuse university. He resigned in 1874, retaining the position of professor of geology and zoology, and becoming special lecturer at Vanderbilt university; in 1879 became prof. geology, etc., in Mich. university. Among his works are: *Sketches of Creation; The Doctrine of Evolution; Reconciliation of Science and Religion; Preadamites;* and *Geological Studies.* Died Feb., 1891.

WINCHENDON, a town in Worcester co., Mass.; on the Boston and Albany and the Fitchburg railroads; 37 miles n.w. of Worcester. It was incorporated in 1764; contains the villages of Bullardville, Centreville, Harrisville, Hydeville, Winchendon Springs, Winchendon Centre, New Boston, and Waterville; has a high school, public library, national and savings banks, and weekly newspaper; and is principally engaged in the manufacture of tubs, pails, chairs, furniture, toys, machinery, and leather. Pop. '90, 4390.

WINCHESTER, a town in Litchfield co., Conn.; on the Philadelphia, Reading, and New England, and the New York, New Haven, and Hartford railroads; containing the borough of Winsted (q. v.), and the villages of West Winsted and Winchester Centre. Pop. '90, 6183.

WINCHESTER, city and co. seat of Clark co., Ky.; on the Chesapeake and Ohio, the Lexington and Eastern, and the Louisville and Nashville railroads; 18 m. e. of Lexington. It is the seat of the Kentucky Wesleyan college (Meth. Epis., S.) and the Winchester female college (non-sect.), and has a high school, college library, national and state banks, electric lights, street railroad, waterworks, newspapers, and considerable lumbering, stock-raising, and manufacturing interests. Pop. '90, 4519.

WINCHESTER, a town in Middlesex co., Mass.; on the Boston and Maine railroad; 8 miles n.e. of Boston. It was incorporated in 1850; contains the villages of Winchester Centre, North Winchester, Cutler's Village, and Symmes Corner; has a high school, public library, savings bank, weekly and monthly periodicals, and many residences of Boston business men; and is principally engaged in the manufacture of school furniture, leather, and machine shop products, and in growing vegetables and flowers. Pop. '90, 4861.

WINCHESTER, city and co. seat of Frederick co., Va.; on the Cumberland Valley and branches of the Baltimore and Ohio railroads; 83 m. n.w. of Washington. It has about 20 churches, national and state banks, gas and electric lights, several academies and institutes, paper, sumac, and flour mills, foundries, and glove, shoe, cigar, and fertilizer factories. On Mar. 12, 1862, it was occupied by the federal gen. Banks, and was during the war the scene of frequent conflicts, and occupied in turn by the federal and confederate army. Pop. '90, 5196.

WINCHESTER, a famous historical city and parliamentary and municipal borough, capital of Hampshire, is situated in the middle of the county, on the right bank of the Itchen, 67 m. s.w. of London by railway, and 60 in a direct line. It consists of one main street, crossed by a number of streets running at right angles to it, and was in early times surrounded by a wall, of which remains exist. The houses for the most part spread over a hill rising from the valley of the Itchen; but the cathedral, and some of the older and more interesting portions of the city, stand on level ground close to the river-bank. The Castle-hill is the site of the old castle or royal palace, built in the 13th c. by Henry III., and of a magnificent hall, of which the only remaining portion is used as the county court. About a mile from the town is the famous hospital of St. Cross, founded in 1136 by a bishop of Winchester, Henry de Blois, for 13 poor men, "decayed and past their strength." It was munificently endowed; but its sources of income have been narrowed, and its ancient charters and grants were destroyed during the 13th century. The hospital is entered by a gateway, after passing which a pleasing view is obtained of the buildings, which occupy three sides of a quadrangle, the fourth side being occupied by a neat, picturesque, ancient church in transition Norman, which formed part of the institution. There is a city library and a museum; the latter contains some very interesting local antiquities. Charles II. commenced a palace here, but the part completed is now used as barracks. The city cross in the High street, dating from the 15th century, is very beautiful in design.

The college of Winchester, originally called "Seinte Marie College of Wynchestre," now Saint Mary's or Winchester college, was founded by William of Wykeham, bishop of Winchester, in 1387, and the buildings were completed in 1393. The buildings are, for the most part, of the age of the founder, and consist of two quadrangles and a cloister, together with recently erected houses for the commoners. The famous *Dulce domum* is sung by all the boys in the courts of the college before the breaking up of the school at the long vacation. The foundation consisted originally of a warden, 10 fellows, 70 scholars, a head-master (*informator*), an usher (*ostiarius*), or second master, 3 chaplains, 3 clerks or singing men, and 16 choristers. By an ordinance of the Oxford university commission, which took effect in 1857, the number of fellowships has been reduced, as vacancies occurred, to 6, the number of scholars being increased to 76, and 8 exhibitions have been founded. The charter of the school, which is in existence, was granted by Richard II. in 1396, and confirmed by all the subsequent sovereigns, Mary excepted, down to Charles II. The visitor is the bishop of Winchester, and the warden and two fellows of New college, Oxford, hold an annual "scrutiny," which, however, is generally merely formal. Winchester possesses 15 fellowships and 30 scholarships at New college, Oxford (also founded by William of Wykeham), open to scholars and commoners alike, and tenable for five years, besides numerous other prizes.

A church is said to have been built at Winchester in the year 169; to have been destroyed in 266, restored in 293, and converted into "a temple of Dagon" (by whom we are to understand Wodin) by the Saxons under Cerdic in 495. In 635 the polluted church was pulled down, and a new one commenced, under the superintendence of Birinus, the first apostle of Wessex; and king Kynegils granted the whole of the land for the space of 7 m. round the city for the support of the episcopal seat and the re-established monks. From the year 674 the succession of bishops of Winchester, of which the celebrated St. Swithin (see SWITHIN, ST.) was one, continues unbroken. Of Birinus's cathedral, however, in which most of the Saxon kings of Wessex (see HEPTARCHY) were interred, and on the altar of which, according to tradition, king Canute hung up his crown after the well-known scene on the sea-shore, no portion remains, and a new cathedral—the present one—was built "from the foundations" by Bishop Walkelin (1070–1097); and after its completion, and the removal into it of the precious relics of Birinus's cathedral, that old edifice was pulled down. William of Wykeham was bishop of Winchester from 1367 to 1404, and has more closely than any other bishop associated his name with his episcopal city and its cathedral. He greatly enlarged and beautified the building, and he began the remarkable transformation of the nave from Norman to perpendicular. The cathedral is 560 ft long—longer than any other English cathedral. Its breadth at the transepts is 208 ft., the length of its nave is 351 ft., its height 86 ft. and a low central Norman tower 186 ft. high. The exterior is somewhat disappointing, owing to its unusual want of decoration, and to the lowness of the tower; but the interior is magnificent, and contains many objects of the highest interest—as the tomb of William Rufus; bronze figures of Charles I. and James I.; mortuary chests which contained the ashes of a number of west Saxon kings and bishops, but which were rifled during the civil war; the golden shrine of St. Swithin, with some excellent specimens of sculpture, both ancient and recent; the tomb of Edmund, the son of king Alfred, and the tomb of Izaak Walton. The various architectural styles to be noted in the cathedral are: Early Norman in the crypt and transepts; early English in the eastern aisles

and chapels behind the presbytery; decorated in the piers and arches of the presbytery; and perpendicular in the nave, which, for beauty and grandeur, is only rivaled by York. After the cathedral, there are some churches of interest in the transition Norman and perpendicular styles; and there are many other buildings of a religious and educational kind. The industries of Winchester are unimportant. Pop. of municipal and parliamentary borough, '91, 19,073, represented by one member.

Winchester, the Roman *Venta Belgarum*, was the site of a British city before the arrival of the Romans in Britain, *Caer-Gwent* (*gwent* = champaign or down). It afterward became a Roman station, and, as such, was a place of considerable importance, and contained temples of Apollo and Concord. When taken by the Saxons in 495, it is said to have contained at least one Christian church. The Saxons called the town Wintanceaster. As the capital of Wessex, Winchester became the capital of England, and even after the Norman conquest was long a chief royal residence. In 1265, during the barons' war, Winchester was sacked, and it never again recovered its commercial prosperity. From the time of Charles II., the town has gradually declined—its chief sources of life and movement being the cathedral and the college.

WINCHESTER, Elhanan, 1751–97; b. Mass.; joined the open communion Baptists, Canterbury, Conn., 1770; ordained pastor of a church, Rehoboth, Mass., 1771; became a close communionist and was excommunicated by his church; resided in South Carolina, 1774–80; pastor of first Baptist church, Philadelphia, 1780; became a preacher of universal restoration, and with a majority of his people formed a new church; went to England, 1787, remaining till 1794, preaching with great success, and publishing various works; returned to America. He published *Five Letters on the Divinity of Christ; Beauties of the Millennium; The Face of Moses Unveiled; Ten Letters to Thomas Paine; Hymns on the Restoration,* and numerous other works. He was a forerunner of the present Universalist denomination.

WINCING MACHINE, the wheel used by dyers for winding out of their dye-vats long pieces of cloth. The vat is often divided by a partition, and the wincing-machine is generally so placed that it will wind the piece of cloth from one compartment to the other, according to the direction given to the handle.

WINCKELMANN, Johann Joachim, well known as the critical expounder and historian of ancient classical art, was born of poor parents in the year 1717, at Stendal, in Prussia. He very early showed an eager desire for knowledge, and being sent to the free school of the place, became so special a favorite with the rector of it, that he was taken into the rector's house as a companion, when age and blindness made some assistance necessary to him. After studying for a time in Berlin, he went, in 1738, to the university of Halle, where he remained two years engaged in the study of theology, which, however, he found so distasteful that, at the end of that time, he relinquished it, accepting a situation as tutor in a private family at Osterburg. In 1743, he became a schoolmaster at Seehausen—a wretched position, from which he was rescued by the count von Bünau, who employed him as secretary in his library at Nothenitz. Here he remained some years. Being in the vicinity of Dresden, he had frequent opportunities of inspecting the famous treasures of art accumulated there. He also made the acquaintance of some artists of eminence, among others, the well known Oeser; and the enthusiasm was awakened which determined his subsequent career. To the theory and history of art he now resolved to devote himself; and on being thrown into the society of the pope's nuncio, cardinal Archinto, he was induced, after some hesitation, to become a Roman Catholic, on a promise of a pension being procured for him, to enable him to proceed to Rome. Thither he repaired in 1755, having previously published at Dresden a treatise, entitled *Gedanken über die Nachahmung der Griech. Werke,* etc. (Reflections on the Imitation of the Antique, 1755). Of this work he issued, in 1756, a new and enlarged edition. At Rome he prosecuted his studies with the utmost ardor, and every facility was afforded him. In 1758, he visited Naples, to examine the celebrated remains of Herculaneum, Pompeii, and Pæstum; and went also to Florence, for the purpose of cataloguing the famous collection of antique gems belonging to baron de Stosch, a labor which occupied him for nine months. Soon after, the cardinal Albani appointed him his librarian, and the salary attached to this post, with the pension continued from Dresden, in itself a somewhat meager pittance, enabled him to prosecute his studies in comfort. The first-fruit of these appeared in his treatise, entitled *Anmerkungen über die Baukunst der Alten* (Remarks on the Architecture of the Ancients), which was printed in Germany in 1762; and two years afterward, the great work of his life, on which he had been long engaged, the celebrated *Geschichte der Kunst des Alterthums* (History of Ancient Art), was issued from the press of Dresden. In 1767 a supplement to it was added. He also gave to the world the result of his researches at Herculaneum; and in 1766, his *Monumenta Antiqua Inedita,* an elaborate work with plates.

In 1768, Winckelmann, by this time famous throughout Europe, set out to revisit Germany. His destination was Berlin; but on the way, a strange yearning seized him for the Italy he had left; on his reaching Munich, it was no longer to be resisted; and he started thence on his return to Rome. He went by Vienna, where the most flattering attentions were paid him; proceeding thence to Trieste, where he came by his tragic

end at the hands of a fellow-traveler, by name Francesco Arcangeli, who murdered him in order to plunder his effects. In this he did not succeed, being scared almost in the act, and presently caught and executed.

Winckelmann was the forerunner of a great movement; and his influence has been deeply felt in all the subsequent literature of the subject to which he devoted himself. Even at this day, when a good deal of it is regarded as obsolete, his great *History* remains as a work not to be neglected by any one seriously concerning himself with the study of this branch of aesthetics. The most complete edition of Winckelmann's works is Fernow, Meyer, and Schultz's (8 vols. new ed. 1828). See the life of Winckelmann by Justi (1866–73).

WINCKELRIED. See Melchtal, Arnold von.

WIND is the air in motion. The force of the wind is measured by anemometers (q.v.), of which some measure the velocity, and others the pressure. The following are a few velocities of wind, translated into popular language: 7 m. an hour is a gentle air; 14 m., a light breeze; 21 m., a good steady breeze; 40 m., a gale; 60 m., a heavy storm; and 80 to 150 m., a hurricane sweeping everything before it. We also add a few comparisons of velocity and pressure: 5 m. an hour is a pressure of 2 oz. on the sq.ft.; 10 m., ½ lb.; 20 m., 2 lbs.; 30 m., 4½ lbs.; 40 m., 8 lbs.; 51 m., 13 lbs.; 60 m., 18 lbs.; 70 m., 24 lbs.; 80 m., 32 lbs.; and 100 m., 50 lbs. During the severe storm which passed over London, on Feb. 6, 1867, the pressure was 35 lbs. to the sq. ft., corresponding to a velocity of 83 m. an hour. A pressure of at least 70 lbs. to the sq.ft. has since been recorded at the Liverpool observatory. Wind is most frequently measured by estimation.

Seamen require more than landsmen to pay attention to every variation in the strength of the wind, as well as its direction, and to adopt such phrases as will render that strength generally intelligible. The *anemometer* (q.v.), which is used on land for this purpose, is unsuited to the wants of seamen. They have found it convenient to divide winds into 12 kinds, in relation to strength, designated thus: *Faint air, light air, light breeze, gentle breeze, fresh breeze, gentle gale, moderate gale, brisk gale, fresh gale, strong gale, hard gale,* and *storm.* This classification was determined in 1806 by Beaufort according to the amount and kind of sail which one of her majesty's ships could safely carry at the moment. The estimate of the wind's force by the scale 0 to 12, means that 0 represents a calm, and 12 a hurricane. If such estimations be divided by 2, and the quotient squared, the result will be the pressure in pounds, approximately.

All wind is caused, directly or indirectly, by changes of temperature. Suppose the temperature of two adjacent regions to become, from any cause, unequal, the air of the warmer, being lighter, will ascend and flow over on the other, while the heavier air of the colder region will flow in below to supply its place. Thus, then, a difference in the temperature of the two regions gives rise to two currents of air—one blowing from the colder to the warmer along the surface of the earth, and the other from the warmer to the colder, in the upper strata of the atmosphere; and these currents will continue to blow till the equilibrium be restored.

Winds are classed into *constant, periodical,* and *variable winds.*

Constant Winds. *The Trade-winds.*—When the surface heated is, roughly speaking, a whole zone, as in the case of the tropics, a surface-wind will set in toward the heated tropical zone from both sides, and uniting will ascend, and then separating, flow as upper currents in opposite directions. Hence, a surface-current will flow from the higher latitudes toward the equator, and an upper current toward the poles. If, then, the earth were at rest, a n. wind would prevail in the northern half of the globe, and a s. wind in the southern half. But these directions are modified by the rotation of the earth on its axis from w. to east. In virtue of this rotation, objects on the earth's surface at the equator are carried round toward the e., at the rate of 17 m. a minute. But as we recede from the equator, this velocity is continually diminished; at lat. 60°, it is only 8½ m. a minute, or half of the velocity at the equator; and at the poles it is nothing. A wind, therefore, blowing along the earth's surface to the equator, is constantly arriving at places which have a greater velocity than itself. Hence, the wind will lag behind, that is, will come up against places toward which it blows, or become an *east* wind. Since, then, the wind n. of the equator is under the influence of two forces—one drawing it s., the other drawing it w.—it will, by the law of the composition of forces, flow in an intermediate direction, that is, from n.e. to s.west. Similarly, in the southern tropic, the wind will blow from s.e. to n.west. All observation confirms this reasoning. From the great service these winds render to navigation, they have been called the trade-winds. It is only in the Pacific and Atlantic oceans that the trade-winds have their full scope. In other parts of the trades' zone, such as southern Asia and intertropical Africa and America, they are more or less diverted from their course by the unequal distribution of land and sea (on which see Monsoon). It is generally stated that in the Atlantic the *north trades* prevail between lat. 9° and 30°, and in the Pacific, between lat. 9° and 26°; and the *south trades,* in the Atlantic, between lat. 4° n. and 22° s., and in the Pacific, between lat. 4° n. and 23½° south. These limits, however, are not stationary, but follow the sun, advancing northward from January to June, and southward from July to December.

Region of Calms.—This is a belt, 4° or 5° broad, stretching across the Atlantic and Pacific, parallel to the equator. It marks the meeting-line of the n. and s. trades, where they mutually neutralize each other. Here also occur heavy rains, and thunder-storms almost daily. This belt varies its position with the trades, reaching its most northern limit in July, and its most southern in January. When the belt of calms nears the African coast, in the gulf of Guinea, the copious rainfall gives rise to the strong steady-blowing gales of that coast, called *tornadoes.*

Periodical Winds. *Land and Sea Breezes.*—These are the most general, as well as most easily explained, of the periodical winds. On the coast, within the tropics, a breeze sets in from the sea in the morning, at first a mere breathing on the land, but gradually it increases to a stiff breeze in the heat of the day, after which it sinks to a calm toward evening. Soon after, a contrary breeze springs up from the land, blows strongly seaward during the night, and dies away in the morning, giving place to the sea-breeze as before. These winds are caused during the day, by the land getting more heated than the sea, consequently the air over it ascends, and the cool air from the sea flows over on the land to supply its place; and during night, by the temperature of the land falling below that of the sea, and the air becoming thereby heavier and denser, flows over the sea as a land-breeze. It is within the tropics where sea-breezes are most marked and constant, because there the sun's heat is greatest, and atmospheric pressure is practically uniform, except in those rare instances where it is disturbed by hurricanes. But in countries such as Great Britain, where atmospheric pressure is most commonly, to some extent, greater or less than that of surrounding regions, the strength of the wind blowing from the high to the low barometer is far stronger than that which would result from the disturbance caused by the unequal heating of land and water; and consequently the sea-breeze is not felt. In the warm months, however, when barometers are nearly uniform over northern and western Europe, there is a gentle sea-breeze all round Great Britain during the heat of the day, and a land-breeze during night. Thus on the coast of Berwickshire, during fine settled summer weather, when the temperature of the land is much warmer than that of the sea during the day, in the morning the wind is n.w. till about 10 A.M., when it veers to n., falling all the time, till finally it sinks to a calm. A little before noon it springs up from n.e. or e., veers to s.e. from 2 to 3 P.M., where it continues till 7 P.M., when it veers to s. and s.w., and gradually sinks to a calm. About sunset it springs up from w. and veers to n.w. during the night, where it continues till next morning. On the other hand, on the w. coast of Scotland, n.w. winds diminish in force toward sunset, giving rise to the weather saying: "The w. wind is a gentleman and goes to bed." Quite analogous to the land and sea breezes are the monsoons (q.v.), which are only the n. trades drawn out of their course in summer by the heated regions of southern Asia—the s.w. monsoon being only a vast sea-breeze blowing on southern Asia, and continuing several months of the year.

Variable Winds.—These winds depend on purely local or temporary causes, such as the nature of the ground, covered with vegetation or bare; the physical configuration of the surface, level or mountainous; the vicinity of the sea or lakes; and the passage of storms. Within the tropics, all except the last of these is borne down, or all but borne down, by the great atmospheric currents, which prevail there in all their force. But in higher latitudes this is not the case; these, therefore, are the regions where variable winds prevail. The most noted of these winds are the simoon (q.v.), sirocco, solano, and harmattan (q.v.). The *bora* is a cold tempestuous wind, blowing from the Alps down on the Adriatic; and the *gregale* is a peculiarly cold, parching, and unhealthy wind, which at certain seasons descends on Malta from Greece. The *puna winds* prevail for four months in the year in a high barren table-land in Peru called the puna; as they are part of the s.e. trade-wind, after having crossed the Andes they are drained of their moisture, and are consequently the most dry and parching winds that occur anywhere on the globe. In traveling over the puna it is necessary to protect the face with a mask from the glare and heat of the day, and from the intense cold of the night. The *east winds* which prevail in the British islands in spring are part of the great northern current which at that season generally descends over Europe through Russia. Their origin explains their dryness and unhealthiness. It is a prevalent notion that the e. winds in this country are damp. It is quite true that many easterly winds are peculiarly damp; all that prevail in the front part of storms (q.v.) are very damp and rainy, they being simply an indraught of the air toward the low barometer which is advancing from the w. at the time; and it is owing to this circumstance that in the e. of Scotland the greater part of the annual rain-fall falls with easterly winds. All of these damp easterly winds, however, soon shift round to some westerly point. But the genuine e. wind, which is the dread of the nervous and of invalids, does not shift to the w., and is specially and intolerably dry. In the third week of May, 1866, this character was strongly marked, when at many places in Scotland the humidity was only 40, and on some occasions as low as 29; the degree of this dryness will be appreciated when it is stated that the dryest month during eleven years ending with 1866, showed a humidity only of 73, saturation being 100. While this wind lasted, the daily range of temperature was double the usual amount, the soil was parched, and the leaves of trees and plants were blackened and destroyed. Deaths from brain-diseases and consumption reach the maximum in Great Britain during the prevalence of e. winds. The *etesian winds* are northerly winds which prevail in sum-

mer on the Mediterranean. They are probably caused by the great heat of North Africa at this season, and consist in a general flow of the air of the cooler Mediterranean to the s., to take the place of the heated air which rises from the sandy deserts. The *mistral* is a steady, violent n.w. wind, felt particularly at Marseilles and the s.e. of France, blowing down on the gulf of Lyons. The *pampero* blows in the summer season from the Andes across the pampas of Buenos Ayres to the sea-coast. It is thus a n.w., or part of the anti-trade of the southern hemisphere, and so far analogous to the stormy winds which sweep over Europe from the s.w. But since it comes from the Andes over the South American continent, it is a dry wind, frequently darkening the sky with clouds of dust, and drying up vegetation.

Lord Bacon remarked that the wind most frequently veers with the sun's motion, or passes round the compass in the direction of n., n.e., e., s.e., s., s.w., w., and n.w. to north. This is from the fact that by far the greater proportion of the storms of north-western Europe follow their course to eastward along paths lying to the n. of the British islands. The late Prof. Dove of Berlin first propounded the *Law of the Rotation of the Winds*, and proved that the whole system of atmospheric currents—constant, periodical, and variable winds—obey the influence of the earth's rotation. See Storms : Weather.

WINDAGE, in a gun, the difference in diameter between the bore of the piece and the projectile with which it is loaded. Formerly, a considerable windage was allowed; but this only served to diminish the force of the explosion, and to give an irregular motion to the shot. In the present rifled artillery, it is sought to reduce the windage to a minimum, as .01 of an inch. Some windage is indispensable, or the shot would jam either going in or coming out.

WINDAGE (from cannon-balls), or Wind Contusions. Military surgeons so often meet with cases in which serious internal mischief (as for instance, the rupture of the liver, concussion of the brain, or even a comminuted fracture of a bone) has been inflicted, without any external marks of violence to indicate its having resulted from the stroke of a cannon-ball, that they were led to the conclusion that solid objects projected with great velocity through the air might inflict such injuries indirectly by aërial percussion; the hurt being inflicted either directly by the force with which the air is driven against the part, or indirectly by the rush of air to re-fill the momentary vacuum created by the rapid passage of the ball. So many observations have, however, been made of cannon-balls passing close to the body (even shaving part of the head, tearing away portions of uniform, or carrying off the external ear or the end of the nose, without further mischief), that this hypothesis is totally untenable, and is now generally rejected. The true explanation of the cases formerly attributed to the windage of cannon-balls appears to rest, according to recent views, "in the peculiar direction, the degree of obliquity with which the missile impinges on the elastic skin, together with the situation of the structures injured beneath the surface, relatively to the weight and momentum of the ball on one side, and hard resisting substances, on the other." See Longmore's article on "Gun-shot Wounds" in Holmes's *System of Surgery*, vol. ii. pp. 18–20, where the subject is fully discussed.

WIN'DERMERE, Winandermere, or Lake Winder, the largest lake in England, called on account of the supposed superiority of its shores, in point of natural beauty, over those of the other lakes of north-western England, the "Queen of the Lakes," is partly in the co. of Lancaster, and partly divides that co. from Westmoreland. It is 14 m. long, and about 1 m. in extreme breadth, is fed by the Brathay and the Rothay, the waters of which become united before entering the lake, and by the streams which drain the neighboring lakelets of Esthwaite, Troutbeck, and Blelham, and discharges its surplus waters southward into Morecambe bay by the Leven. Next to Wast Water, Windermere is the deepest of all the English lakes, its greatest depth being about 240 ft., while Wast Water is 270 ft. deep. It contains a number of islands, the largest being 28 acres in superficial extent, and the chief of which are Rough Holm, House Holm, Lady Holm and Curwen's or Belle Isle. Soft rich beauty is the principal characteristic of the islands of the lake, of the wooded shores, and of the scenery around; there being a total absence of that wildness and sublimity which characterizes some of the other lakes, except at the n. end, where Langdale Pikes, Harrison Stickle, Sca Fell, and Bow Fell stand forward prominently in the landscape. The e. and w. shores are bounded by gentle eminences exuberantly wooded, and numerous villas and cottages peeping out of the woods give an aspect of quiet domesticity to the landscape. About 1 m. from Waterhead, at the n. extremity of the lake, is the town of Ambleside, 1½ m. n.w. of which is Rydal, the residence of the poet Wordsworth; in the vicinity of Waterhead is Dove's Nest, the cottage at one time occupied by Mrs. Hemans; further down the e. shore is Elleray, famous as the residence of "Christopher North;" and half-way down the lake, on the eastern shore, is Bowness.

WIND-FLOWER. See Anemone.

WINDGALLS are puffy swellings about the joints of animals, particularly of horses, correspond to the ganglions of human surgery, and result from irritation and inflammation being set up within the delicate synovial cavities, which thus secrete an unusual quantity of thickened synovia. Rest, moderate work, wet bandages, and occasional

blisters reduce the swellings, but with fast roadwork they are apt to re-appear, especially in old horses.

WINDHAM, a co. in n.e. Connecticut, bordering on Massachusetts ; 520 sq.m.; pop. '90, 45,158, chiefly of American birth, with colored ; drained by the Quinnebaug, Shetucket, and other rivers. Its manufactures are important. Co. seat, Putnam.

WINDHAM, a co. in s.e. Vermont, bordering on Massachusetts and New Hampshire, having the Connecticut river for its e. boundary, drained by the West and Deerfield rivers ; 765 sq.m. ; pop. '90, 26,547, chiefly of American birth. Its mineral resources are important, embracing gneiss, limestone, slate, and granite. Co. seat, Newfane.

WINDHAM, Right Hon. WILLIAM, English statesman, b. 1750, in Golden square, London, was son of Col. Windham of Felbrigg Hall, Norfolk, in which county the family had been settled since the 12th century. He was educated at Eton, and was afterward sent to Glasgow university, where he studied mathematics with success. In 1761 he entered at University college, Oxford. After the usual course of travel, he began to acquire notoriety as an opponent of the administration of lord North. Historatorical exercises were interrupted by a design of visiting the north pole, and he accompanied the expedition in which Nelson, then a youth, took part. He found the sea-sickness intolerable, was put on shore in Norway, and returned home in a Greenland whaler. In 1781 he was returned to parliament for Norwich, and took his seat among the whigs. In 1783, on the formation of the Portland ministry, remarkable for the coalition of lord North and Mr. Fox, he became principal secretary to lord Northington, then lord-lieutenant of Ireland. Before leaving England, he called upon his friend Dr. Johnson, and lamented that his situation would compel him to sanction practices he could not approve. "Don't be afraid, sir," replied the doctor, "you will soon make a very pretty rascal." Ill-health, or, perhaps, conscientious scruples, soon caused him to resign his secretaryship. In 1784 he seconded Burke's motion for a representation to the throne on the state of the nation. There is an admirable and characteristic sketch of Windham in Macaulay's description of the trial of Warren Hastings: "There, with eyes momentarily fixed on Burke, appeared the first gentleman of the age, his form developed by every manly exercise, his face beaming with intelligence and spirit—the ingenious, the chivalrous, the high-souled Windham." Abandoning his old friends the whigs, he followed Mr. Burke, and ranged himself on the side of Mr. Pitt in opposing the speculative doctrines of the French revolution, and supporting the war with France. In 1794 he became secretary-at-war under Mr. Pitt, with a seat in the cabinet. He now attacked his former friends with the utmost ascerbity. He went out with Pitt in 1801, and sided with the Grenvilles in stigmatizing the peace of Amiens, concluded by the Addington administration in 1801. This lost him his seat for Norwich, but he was elected for St. Mawes, and, on the return of the Grenville party to power, he became colonial secretary. In 1806 he brought forward his plan of limited service in the army, proposing that the infantry should be enlisted for seven years only, with liberty to renew their services for another seven years, receiving an increase of pay; cavalry and artillery to be enlisted for ten years, the second period six, and the third five years. He also proposed to increase the pay and pensions of officers and men, and generally to better the condition of the soldier. The plan was strenously opposed, but passed into a law. He went out of office in 1807, when the Portland administration was formed (having previously declined the offer of a peerage), and strongly denounced the expedition against Copenhagen, and afterward the disastrous Walcheren expedition. In 1808 a clause was introduced by lord Castlereagh (who had succeeded Windham in office) into the mutiny act, permitting men to enlist for life, contrary to Windham's scheme of limited service, which was, however, readopted in 1847. In May he underwent a surgical operation for extracting a tumor from his hip, from the effects of which he died June 3, 1810.

Windham was an excellent speaker, and one of the most effective and skillful debaters of his time, as will appear from his speeches collected by Mr. Amyott, his secretary, and published, with a life prefixed, in 3 vols. 8vo. Fox said he had never met a meditating man with so much activity, or a reading man with so much practical knowledge. Pitt declared that his speeches were the finest productions possible of a warm imagination and fancy. Canning described his eloquence as, if not the most commanding, at least the most insinuating that was ever heard in the house of commons. Dr. Johnson, who was much attached to him, declared that, in the regions of literature, Windham was *inter stellas luna minores*. He possessed brilliant conversational powers. Yet, notwithstanding his great talents and rare gifts, he appears in the page of history as the mere shadow of a man. In his lifetime he gained the disparaging nickname of "the weathercock." He was fond of paradox, and once defended bull-baiting in the house of commons with great vivacity and ingenuity. Although a man of refinement and sensitiveness, he had a passion for pugilism, and was a regular attendant upon prize-fights. The publication of his *Diary from* 1784 *to* 1810, by Mrs. Henry Baring (1866) discloses the secret of his weakness. Morbidly self-conscious, he was always watching himself, pulling himself to pieces, and recording the doubts that haunted him as to his mental capacity. Acknowledged by his contemporaries to be one of the manliest of men, he

succeeded in infusing into his mind doubts with respect to his own courage. He got rid of this delusion by going under fire in the trenches at the siege of Valenciennes; but no sooner was he convinced that he was not a coward than he began to be afraid he was discreditably insensible to the scenes which were passing around him! With brilliant faculties, he was in fact an intellectual hypochondriac incapable of achieving anything great.

WINDISCHGRÄTZ, Alfred, Prince von, 1778–1862, Austrian general, fought with distinction in the Napoleonic campaigns of 1813–14, but was more famous for the part he played in the suppression of the revolution of 1848. When the riot broke out in the streets of Prague and the people clamored for arms, W. refused to yield to their demands, and after a sharp contest, in which his wife and son were killed by the revolutionists, he put down the insurrection. He afterwards fought against the Hungarians, but in this campaign he did not accomplish much, and was blamed for his inactivity. Having retired to his Bohemian estates, he published in 1851 *Winterfeldzug* 1848–49 *in Ungarn.*

WIND INSTRUMENTS, musical instruments of which the sounds are produced by the agitation of an inclosed column of air. They are generally classified into *wood instruments* and *brass instruments* (both of which are played by the breath), and the *organ.*

The name wood instruments is applied to musical instruments constructed either of wood or of ivory, of which the principal are the flute, piccolo, clarionet, flageolet, basset-horn, oboe, and bassoon. They are generally characterized by a soft, smooth, aerial tone, resembling the human voice. By the use of holes and keys, considerable compass is given to them; they are capable of producing only one sound at a time, but with considerable command of piano and forte. Of brass instruments the chief are the horn, trumpet, trombone, cornet-a-piston, euphonium, bombardon, and ophicleide. They are generally more powerful, and their quality more piercing than wood instruments; the ophicleide, however, approaching more than the rest to wood instruments in capabilities and tone. In a full orchestra there are generally two flutes, two oboes, two clarionets, two or four horns, and two bassoons, frequently with the addition of two basset-horns, one or two piccolos, and one or two ophicleides or trombones. Each part, except when there is an unusually large number of bow-instruments, is single.

The organ is a combination of a large number of wind-instruments, sounded, not by the breath, but by the admission of air into the wind-chest, by means of keys pressed down by the performer. See Musical Instruments.

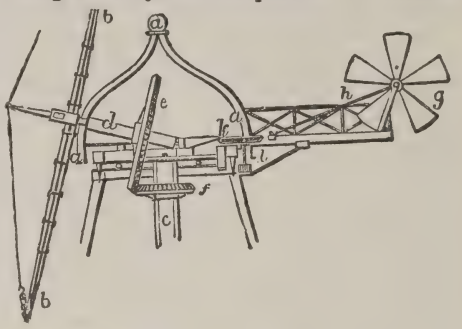
WINDLASS is that modification of the wheel and axle which is employed in raising weights, such as bucketsful of water from a well, coals from a pit, etc. Its simplest form is that of an axle supported by pivots on two strong upright pieces, and pierced near one end with four or six square holes, into which handles, known as *handspikes,* are inserted. In other forms, a winch at each end is substituted for the handspikes. If the weight (say a bucket of water) is to be lifted a considerable distance, the length of the rope which attaches it to the axle largely increases the weight, and thus aids the power when descending, and counteracts it when ascending. This difficulty is partially got over by employing a double rope with two buckets, one of which ascends while the other descends; but this modification, though partially effective for the end in view, lends aid to the power when aid is least, and hinders it when aid is most, required. A more efficacious plan is to form the axle not cylindrical, but of a barrel-shape, like two truncated cones placed base to base, and to fasten two ropes, one to each end, so that when coiled up round the barrel they approach the middle; in this case, when one rope is fully uncoiled, and winding-up commences, the gross weight, which is then at its maximum, acts at the minimum leverage of the end, and as the progress in winding up diminishes the weight, its leverage so increases that the momentum is preserved uniform. On the other hand, the empty bucket, when commencing its descent, acts at its greatest leverage, and as the unwinding of the rope adds to the weight, its leverage becomes smaller, so that the momentum of the descending weight always remains the same and thus the strain on the power is preserved uniform. The ratio of the weight to the power it is sometimes found necessary to increase greatly; but with the ordinary windlass this could only be effected by similarly increasing the ratio between the leverage of the handle and the radius of the axle—an object attained by a great increase of the former, rendering the machine too cumbrous, or by greatly diminishing the latter, and so weakening it. The desired result is attained, however, in a manner not liable to these objections, by the use of the *differential axle,* an axle of which one-half is of greater diameter than the other, and the single rope, after being coiled round the whole axle from end to end, is fastened at each end of the axle, and the weight is hung by a pulley, which is supported in a bulge in the center of the rope. As the portion of the rope on one-half of the axle is unwound, that on the other half is wound up; but since the rates of winding and unwinding are different, the bulge of the rope increases when the rope is wound *on* the smaller end of the axle, and decreases when it is wound *off* the smaller end. The more nearly equal the two radii of the axle are, the greater is the weight which can be raised by the power—the ratio between the two being

$$\frac{W}{P} = \frac{\text{radius of circle described by power}}{\text{difference of radii of the portions of the axle}};$$

so that if the radius of the power is 18 in., and the radii of the axle 5 and 4 in., the power balances a weight = 18 times itself; while the strength of the axle requires

to be only equal to that of one of the ordinary kind, in which the power can only balance a weight = $4\frac{1}{2}$ times itself. The same principle is applied to the screw (q.v.). For a very accurate estimate of the mechanical advantage of the windlass, the thickness of the rope must be taken into account, by adding half of its diameter to the radius of the axle.

WINDMILL is a mill for grinding corn, sawing wood, or performing any other species of work for which fixed machinery can be employed, the motive-power being the force of the wind acting on a set of sails in a manner similar to that of a current of water impinging obliquely on the float-boards of a water-wheel. The structure is a conical or pyramidal tower of considerable height, and covered over at the top with a species of dome, *aaa* (see fig.) which is so fastened as to revolve upon it round the upper extremity of the shaft *c*, as a center, the motion being aided by the interposition of "castors" between the wooden rings which form respectively the base of the dome and the top of the tower; the sails, *b*, *b*, are attached to the extremity of the axis *d*, so as to revolve in a plane at right angles to it, and the motion they communicate to the axis is transferred by the beveled wheels *e* and *f* to the upright shaft *c*, by which it is in turn conveyed to the working machinery at the bottom of the tower. The axis *d* of the sails, which is inclined at an angle of about 10° to the horizontal, is fixed at one end to a projection from the top of the shaft *c*, and at the other to a circular orifice in the side of the dome, so that it revolves with the latter, carrying the sails along with it; this arrangement is adopted for the purpose of enabling the plane of rotation of the sails to be placed always at right angles to the direction of the wind. This transference of the plane of rotation was at one time effected by manual labor applied to a winch at the bottom of the tower, the rotation being communicated, by an endless band and wheel-work above, to the dome, the outer circumference of the base of which, was, for this purpose, furnished with a circle of rack-work. But this clumsy arrangement was superseded in English windmills by an ingenious contrivance due to sir William Cubitt, by which the wind itself was made to turn the sails into their proper position. The apparatus by which this is effected consists of a revolving *flyer* or fan, *g*, projecting from a gallery fastened to the dome on the side opposite to the sails; *h*, a long thin shaft to which a revolving motion is communicated by a toothed wheel on its outer extremity, from a corresponding wheel on the axis of the flyer (these wheels are not seen in the fig., being behind the flyer); a pinion at the other end of the shaft acts upon the cog-wheel *k*, which carries, on the lower extremity of its axis, a pinion *l*; and this last can, at pleasure, be put into gearing with the rack-work or cog-circle on the lower edge of the dome. The sails are four in number. Each sail consists of a *whip* or radius of from 33 to 40 ft. in length, firmly fastened at right angles to the sail-axle, and pierced at from $\frac{1}{6}$ or $\frac{1}{7}$ of its length, from the axle to its extremity with about 20 holes, into each of which is inserted a cross-bar of 5 to 6 ft. in length; and this frame-work, strengthened generally by light rods connecting the ends of the cross-bars, is then covered with canvas. The cross-bars, however, are not set in the plane of revolution of the whips, for, in that case, the wind, acting in a direction coinciding with that of the sail-axle, would impinge perpendicularly on the sails, and no rotatory motion would result; the bars, therefore, are set at an angle to this perpendicular direction, yet not all at the same angle, for the velocity of each point of the sail increasing with its distance from the sail-axle, the inclination must vary from the first cross-bar to the outer extremity. It is found that a variation of the angle from 18°, at the first cross-bar, to 7° at the extremity, is a very effective form. The amount of sail that a windmill can carry with advantage is limited, according to Mr. Smeaton (q.v.), one of the great authorities on this subject, to $\frac{1}{3}$ of the area of the circle described by one whip; the velocities of a sail, when unconnected with, and when producing its maximum effect on the machinery below, are as 3 to 2; also, the increase of useful effect varies with the square of the wind's velocity, and is proportional to the cube of the length of the whip, in sails of similar form. A windmill with sails of 40 ft. radius is equivalent to 65,000 foot-pounds per minute. Most of the early improvements in windmills have had for their object the regulation of the sail-area exposed to the wind to counterbalance the variations in the latter's force, and so produce uniformity of motion; but these are too numerous to be here noticed. Within recent years the United States have done a very large business in windmills, and most of the modern improvements in them are also due to this country. Wheels of the types described above are now practically obsolete and those in general use are of the American type, having a large number of narrow blades or sails, either of wood or iron, a rudder or tailpiece for keeping the wheel with its face to the wind, and the high conical tower, usually an open steel-frame structure. In many cases these towers are surmounted by a tank in which water is stored for distribution through adjacent buildings.



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WINDMILLS.—1. Trull's windmill; 2, mechanism thereof. 3. Brown's windmill and its me
of 8. 10. Dr. Frank's. 11. Lempke's. 12. Brewster's. 13. Witting's. 14. Mec
windmill.

nism (4, 5). 6. Field's. 7. Goodwin-Hawkin's. 8. Johnson's windmill. 9. Mechanism
ism of 13. 15. Upper part of a tower windmill. 16. Cubit's windmill. 17. Kirchweger's

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The regulation of windmills is a subject on which much ingenuity has been spent, and a number of automatic speed regulators have been patented, most of which are based on one of the two following principles. In one case the wheel is made with immovable slats or sails, and by means of an auxiliary rudder or other device is caused to turn its face at a greater or less angle to the direction of the wind according to its velocity. The maximum speed is attained when the wheel stands vertical to the direction of the wind, and the minimum when it is parallel to it. The other method of regulation consists in turning the slats by a centrifugal governor so as to present more or less surface to the wind. The latter is known as a sectional wheel, and the former as a solid wheel. Windmills were introduced into Europe from the Saracens, and were formerly much more extensively used in England than now. They are, however, still common in the midland and southern districts; on the continent, especially in Holland and France.

WINDOM, William, b. Ohio, 1827; studied law, and was called to the bar. After practising for several years in his native state, he went to Minnesota in 1855; was a member of congress from that state, 1859–69; and in 1870 became a U. S. senator by appointment to fill a vacancy. He was elected for a full term in 1871; re-elected in 1876, and resigned in 1881 to become secretary of the treasury in President Garfield's cabinet. In his short term of service before the president's death he showed high ability. He was returned to the senate, and served till the close of his term in 1883. In 1889 he became sec. of the treasury in Pres. Harrison's cabinet. He died, Jan. 29, 1891.

WINDOW (connected with *wind*, as Lat. *fenestra* with *ventus*) is an opening in the wall of a building for the admission of light and air. In the east, from time immemorial, windows open, not upon the street, but upon the court, and are usually provided with lattices or jalousies. The Chinese use, instead of window-glass, a thin stuff varnished with shining lac, polished oyster-shells, and thin plates of horn. Among the Romans windows were originally closed with shutters; afterward they were made of a transparent stone, *lapis specularis*, which, from the description, can be nothing else than mica; and, in the 2d c. after Christ, of horn. According to some there are traces of glass windows having been used in Pompeii; but the matter is doubtful. The first indisputable mention of glass windows is made by Gregory of Tours in the 4th c. of our era, who speaks of church windows of colored glass. Wilfrid (q.v.), on succeeding to the arch bishopric of York in 669, filled the vacant windows of the cathedral with glass. In 674 abbot Benedict Biscop brought artists from France to glaze the windows of the abbey of Weremouth; and the bishop of Worcester did the same in 726. Leo III., in the end of the 8th c., put glass windows into the church of the Lateran. Glass began to be used in windows of private houses in England as early as 1180; in France in the 14th century. As late as 1458 it struck Æneas Sylvius very much that in Vienna most of the windows were glazed. See Glass.

In ancient temple architecture, windows were unknown—the light being obtained from openings in the roof. In Gothic architecture, however, the window is one of the most important features, giving, by the infinite variety of its outline, and the graceful forms of its tracery, as much character and beauty to the Gothic edifices as the styles and colonnades of ancient art gave to the classic temples.

In the early Gothic or Norman style, the windows were small and comparatively stunted—they were either simple openings with semicircular head, or two such grouped together with a larger arch over both, and with the usual moldings and ornaments of the style. The inside had generally a deep splay, and simple molding on the outside. Small circular windows sometimes occur in Norman work.

In the early English style the windows were more elongated, and had pointed arches. They are frequently grouped in twos or threes, and placed so close that the wall between becomes a mullion. The wall over the group contained within the inclosing arch then becomes perforated with a quatrefoil or other ornamental opening, and thus the simpler forms of tracery become introduced. The interior arches are splayed off, and are frequently very elaborately decorated with shafts and arch moldings. The lancet window (so called from its shape) is common in this style. Circular windows are also used with tracery formed by little radiating shafts with small arches. The triangular window, on a small scale, is also occasionally to be met with.

It is in the decorated style that the windows become enlarged and filled with mullions and tracery. This is at first simple, and composed of geometric figures such as the origin and progress of tracery (q.v.) naturally led to. As the style advanced, more flowing forms were introduced, until, in the 15th c., the tracery passed into the perpendicular (q.v.) style in England, and into the flamboyant (q.v.) in France. The heads of the lights, and the apertures in the tracery, are usually foiled, and the inner jambs are splayed and ornamented with moldings, shafts, etc. In elaborately traceried windows, the jamb and arch moldings are occasionally very small, but they are usually bold and deep.

In the later Tudor style the window-heads became flattened into the four-center arch; and in the time of Elizabeth and James I. the arch gave place altogether to the flat lintel with the opening divided by mullions into rectangular lights, sometimes foiled at top. Circular windows, with elaborate tracery, are chiefly found in the decorated period.

In domestic buildings the windows are similar to the above, but square-headed win-

dows occur more frequently to suit the height of the floors; and the space between the sill and the floor is recessed and fitted with seats. Transoms are also of common occurence. The bow or bay window (q.v.) is also a frequent and very elegant feature in the later Gothic buildings.

In the revived classic styles the windows are almost invariably plain rectangular openings, with either a flat lintel or semicircular arch-head. They have sometimes architraves round the jambs and lintel, or are ornamented with pillars supporting an entablature or pediment above. The architraves are frequently carved, and the cornices carried on trusses at each side.

The style of shop-fronts has been much modified, and the windows enlarged, in consequence of the facilities afforded by the use of plate-glass.

WINDPIPE. See TRACHEA.

WINDSOR, a co. in e. Vermont, bordering on New Hampshire, having the Connecticut river for its e. boundary, drained by the White, Black, and Quechee rivers; 900 sq.m.; pop. '90, 31,706 of American birth, 95 colored. It contains Ascutney mountain in the s.e. rising 3320 ft. above the level of the sea. Co. seat, Woodstock.

WINDSOR, a t. in Hartford co., Conn., on the Connecticut river, and the New York, New Haven, and Hartford railroad; 7 m. n. of Hartford. It was settled in 1635; contains several villages; and has electric railroads connecting the villages and Hartford, young ladies' institute, public library, and manufactories of cheese, canned goods, electrical supplies, tobacco, worsted goods, hosiery, paper, and machine screws. The town has an interesting history, and in its old cemetery are the remains of a number of distinguished people. Pop. '90, 2954.

WINDSOR, a tp. in Bertie co., N. Car.; including Windsor, the co. seat. Pop. '90, 4643.

WINDSOR, properly called NEW WINDSOR, a municipal and parliamentary borough of Berkshire, beautifully situated on the right bank of the Thames, 21 m. s.w. of London. Windsor and Eton in reality form one town. The town is chiefly interesting on account of its being the scene of *The Merry Wives of Windsor,* and the antiquity of its castle and parks, which have been a favorite residence of English monarchs, especially since the time of William the Conqueror. The elevated plateau of natural chalk upon which it stands marked it out, no doubt, as a naturally strong place from the earliest dates, but the deficiency of water which such a position entailed was a serious objection to its being adopted as a permanent residence for many years. The older palace of the English kings was at *Old* Windsor about 2 m. distant, and considerable doubt seems to exist among antiquaries and historians as to the first English king who built solid work of masonry at Windsor Castle. In the time of Edward the Confessor it was probably a wooden structure, as stone was difficult to be had, and wood was abundant. William the Conqueror probably built the first substantial stone buildings, and regularly fortified the place; but the absence of water, except what was carried to it from the Thames, must have for a long time been a serious drawback to its importance as a military station. The history of the existing fabric begins in the reign of Henry III. The buildings may be said to be grouped in three portions—the middle ward containing the round tower; the lower ward on the w., containing St. George's chapel, the houses of the military knights, cloisters, etc.; and the upper ward on the e., containing the sovereign's private apartments. The unfinished chapel which was begun by Henry III., was completed by Edward III., rebuilt by Henry VII., and added to by cardinal Wolsey. Under this chapel is the burial vault of the present royal family. The round-tower, formerly believed to be Norman, but in which there is not a single yard of Norman masonry, was built in the 18th year of Edward III. to receive the round table of the knights of the newly-founded order of the garter. Pop. (1891) 12,327. The park and forest immediately adjoining contain many historic trees, such as Elizabeth's oak; Shakespeare's oak; the long walk, made in the reign of Charles II., and queen Anne's ride of elms, 3 m. long.

WINDSOR, a t. and co. seat of Hants co., Nova Scotia, on the Dominion and Atlantic railroad; pop. '91, 2838. It has churches, schools, banks, a newspaper, iron foundry, several mills, ship-yards, and electric lights. King's college, the most important in Nova Scotia, is here.

WINDSOR, a t. in Essex co., Ont., Canada; on the Detroit river and the Grand Trunk, Michigan Central, and Canadian Pacific railroads; opposite Detroit. It has powerful steamers connecting with Detroit, electric lights and street railroads, numerous churches and public schools, several branch banks and important manufactures. Pop. '91, 10,322.

WINDTHORST, LUDWIG (1812–1891), b. in Prussia; studied at Göttingen and Heidelberg. In 1863 he was Minister of Justice in the Kingdom of Hanover, and after the annexation of Hanover to Prussia in 1866, the leader of the Roman Catholic party in the Prussian parliament and the Reichstag, and a formidable opponent of Prince Bismarck (q.v.). See CULTUR KAMPF; POLITICAL PARTIES, GERMAN.

WINDWARD ISLANDS. See ANTILLES.

WINE, CHEMISTRY AND MANUFACTURE OF. Before entering into the chemistry of this subject, it is necessary that the composition of the grape, from whose juice it is derived, should be understood; and as there is an immense variety of vines yielding grapes

of corresponding variety, and as the same variety* will, under different external influences, produce very different grapes, it is obvious that our researches must be confined to the most typical form of grapes. The principal component of the juice of ripe grapes is water, in which are various substances, either held in solution or very minutely divided. The juice as obtained by pressure, is thick, and exposure to the heat of the sun rapidly changes it into a fermented liquid. As principal components held in solution in the water, Professor Mulder mentions "sugar (both grape-sugar and fruit-sugar), gelatine or pectine; gum, fat, wax, vegetable albumen, vegetable gluten, and some other substances of the nature of extractive matters, which are not, however, accurately determined; tartaric acid, both free and combined with potash (as cream of tartar), partly also combined with lime; in some cases, we find also racemic acid, malic acid, partly quite free, partly combined with lime, and, according to some, tartrate of potash and alumina; further, oxide of manganese and oxide of iron, sulphate of potash, common salt, phosphate of lime, magnesia, and silicic acid may also exist."—*Chemistry of Wine*, p. 5. Although no other ingredients have as yet been discovered in grape-juice, others, which only appear during fermentation, and impart not only the vinous smell common to all wines, but the aroma (bouquet) and the flavor peculiar to each wine, must exist in it in small quantities. In those cases where the skins are allowed, as in the preparation of red wine, to ferment with the juice, the constituents imparting odor and flavor may be drawn from them. Coloring matter and tannic acid are undoubtedly found in the skin, and are thus imparted to red wines. Moreover, the grape-stones, which are left with the skins, yield tannic acid freely during fermentation. The different proportions in which the inorganic matters—the potash, soda, lime, magnesia, iron, manganese, sulphuric acid, phosphoric acid, and chlorine—exist in grape-juice, exert a very great influence upon the quality of the wine, both in relation to its color and its taste. A relative excess of phosphoric acid, or of lime, or of soda, will induce changes sufficiently obvious to the chemist, but which we have not space to discuss. With regard to the acids of grape-juice, or *must*, as it is technically called, professor Mulder observes that, as a general rule, the three—viz., tartaric, malic, and citric—are rarely found together in one fruit, and he doubts whether the presence of citric acid has been fully proved. Malic acid exists in unripe, and tartaric acid in ripe grapes; and while no malic acid exists in wine made from perfectly ripe grapes, a small quantity is present in most wines. In the article Tartaric Acid, it is shown that a nearly allied acid *racemic acid*, exists in exceptional cases in grapes. The quality of wine is only affected if this acid be largely present, because less lime than usual will be found in it, racemate of lime being less soluble than tartrate of lime, and further, because cream of tartar is more soluble than biracemate of potash. Such wines are consequently sweeter, and—if red wines—darker colored, than wines containing only tartaric acid. The quantity of sugar varies extremely. In the juice of very ripe grapes, it may reach 40 per cent. According to Fontenelle, the juice produced in the s. of France contains from 30 to 18 per cent., while in the neighborhood of Stuttgart, Reuss determines it at from 25 to 13 per cent. In the low and variable temperature of Holland, the juice of the best grapes yields only 10 or 12 per cent. of sugar. The composition of the albuminous matter is not clearly determined. In an analysis of the must of the Riessling grapes of Grumbach, Beltz found that the gluten (no albumen was found) was thirty times less abundant than the sugar. It probably varies at from 1 to ½ per cent. The only other ingredient requiring notice is fat, which is chiefly but not entirely derived from the grape-stones, in which it is an abundant ingredient. It occurs in wine, in minute quantity, in the form of a fatty acid.

On the subject of the fermentation of the grape-juice we shall only offer a few remarks. It has been already stated that the saccharine contents of grape-juice range from 12 to 30 per cent. If we regard all this sugar as grape-sugar, $C_6H_{12}O_6$, with an equivalent of 180, then each molecule may be resolved into 2 molecules of alcohol, $C_2H_5 \cdot OH$, with an equivalent of 46, and 2 of carbonic acid gas, CO_2, with an equivalent of 44, according to the equation—

$$\overbrace{C_6H_{12}O_6}^{\text{Grape-sugar.}} = \overbrace{2C_2H_5 \cdot OH}^{\text{Alcohol.}} + \overbrace{2CO_2}^{\text{Carbonic Acid.}},$$

provided that there is no loss; or under the most favorable conditions of fermentation, 180 parts (by weight) of anhydrous grape-sugar, or 198 of the hydrated sugar (with the formula, $C_6H_{12}O_6 \cdot H_2O$), may yield 92 parts of alcohol; or, roughly speaking, 2 parts of sugar yield 1 of alcohol. "According to this," says Mulder, the juice of French and German grapes gives, when analyzed, as a maximum, from 7 to 15 per cent. of alcohol by weight. But some of the sugar remains undissolved, and, during fermentation, more alcohol is evaporated than water; therefore, for such grape-juice, or rather for the wine to be produced from it, the alcoholic contents must be under 15 per cent as a maximum, and 7 per cent as minimum."—*Op. cit.*, pp, 49, 50. According to Mulder, sugar is found

* A certain variety of grape, when grown upon the Rhine, furnishes a species of Hock; the same grape when raised in the valley of the Tagus, yields Bucellas: while in the island of Madeira it produces the wine known as Sercial, which has a flavor quite different from either of the others. See Miller's *Organic Chemistry*, 3d ed. p. 187.

in all wine,* and its quantity depends to a considerable extent upon the treatment to which the grapes are subjected before pressure. Tokay wine, for example, is prepared from grapes which have been allowed not only to get over-ripe, but partly to dry on the vines; *vin de paille* is obtained from grapes dried on straw exposed to the sun; and in both these cases, water is evaporated, and the concentrated juice yields a wine of extra strength. The strong heavy wines used by the ancients were thus prepared. When the grapes are dried on the vine, the wine is called *vin sec;* and when the juice has been evaporated by the aid of heat, the wine is called *vin cotti.*

In consequence of the close connection which exists between the amount of sugar in the grape-juice and the excellence of the wine which it yields, attempts are often made, especially in bad seasons (want of heat and light, and excess of rain), to introduce extraneous sugar into the juice; or, as it is technically called to *doctor* it. For this purpose, a cheap fermentable sugar is added to the sour juice, an adulteration which cannot subsequently be detected by chemistry, although it may be suspected, from the absence of the proper aroma from the wine. Similarly, sugar is often added to good grape-juice, in order to obtain a stronger wine than the natural product. Many imitations of port wine are thus manufactured. The character of the wine is much influenced by the extent to which the process of fermentation is allowed to proceed. If it goes on till all the sugar is converted into alcohol, a *dry* wine is produced; when it is checked before the change is completed, a rich *fruity* wine is produced; and when the wine is bottled while the fermentation is still in progress, effervescent wine is formed.

Shortly after the must has passed from the wine-press symptoms of fermentation appear; the juice becomes more turbid, bubbles rise to the surface, and a froth soon settles there. This process in a moderate climate usually reaches its highest point in three or four days; and before it is quite finished the whole liquid mass is stirred up so as to re-excite the process. For this purpose, in many districts a naked man used (we do not know if the custom generally still exists) to go into the wine-tub, who both accomplished the necessary stirring and promoted fermentation by his animal heat. Several persons have been killed in this way by suffocation from the atmosphere of carbonic acid gas. In two or three weeks the fluid becomes comparatively clear, and a precipitate forms at the bottom. The wine is now removed from the sediment into another vessel, and a slow form of fermentation—*after-fermentation*, as it is termed—goes on for several months, sugar being constantly converted into alcohol and carbonic acid, and a fresh precipitate forming at the bottom. Several similar changes into other vessels are made, to get rid of the sediment, till it is fit for transferring into casks. That the process of fermentation may go on satisfactorily, not only must water, sugar, and a nitrogenous matter in a state of actual change be present, but there must be a certain temperature and a certain amount of atmospheric air present. "Although," says Mulder, "there is a wide interval between the extremes of temperature at which fermentation is possible, the boundary is very narrow which limits good and active fermentation in every kind of wine. The grapes of each country ripened under different degrees of summer warmth and very unequally rich in constituents, require very different temperatures during fermentation; and different temperatures are also required for grapes which are the product of a warmer or a colder summer. But on these points we have little accurate knowledge. All we know is that a high temperature during autumn promotes fermentation, and a low one is detrimental to it; and that inequality of temperature during fermentation is extremely injurious, and not unfrequently spoils the wine altogether."—*Op. cit.* p. 61. To what extent it is expedient to admit atmospheric air to the must, so that the fermentation may go on most favorably, is a point regarding which there has been much discussion, and which is not definitely settled. While some have asserted that no air is necessary to the development of fermentation, others have maintained that the wine is improved by the free admission of air during fermentation. Gay-Lussac proved experimentally that air is essential to initiate fermentation, which would then be continued without any fresh supply; and for many years wine was made in France with an almost total exclusion of air from the fluid by an arrangement intended to prevent the escape of alcohol by evaporation; but when the same chemist proved that by the use of open vats scarcely $\frac{1}{200}$ part of the alcohol was lost, this arrangement fell into disuse. Judging from the method of preparing Bavarian beer, in which air is allowed to enter freely, Liebig recommended the same in the case of wine, and suggested that a large opening should be made in the casks in which fermentation takes place. This method has been tried on a large scale by Von Babo, Crasso, and others, with red wine, which was found to be of a better quality than that which underwent the same process in a cask which was closed, and only provided with a glass tube for the escape of the carbonic acid. But in other experiments made with white wine, the wine in open casks appeared to lose in aroma; and hence the solution of this question apparently depends on the kind of wine. Liebig's opinion has been very fiercely, and, as Mulder thinks, unfairly attacked; the probability is that wines containing much sugar may be allowed

* Dr. Bence Jones, in the appendix to his translation of Mulder's work, declares, on the other hand, that while port, sherry (except in two instances), Madeira, and champagne, always contain sugar; claret, Burgundy, Rhine, and Moselle wine (excepting one sample of sauterne) are always free from every kind of sugar.

with advantage to ferment in closed vessels, while those less rich in that substance may be left in open casks, provided the temperature be low and equable. When the main object is to increase the quantity of alcohol, the admission of much air is injurious, since it promotes the formation of acetic acid, and causes a corresponding loss of alcohol.

The actual substance—*ferment*—which causes the breaking up of sugar into alcohol and carbonic acid, has been submitted to careful chemical and microscopical examination. One hundred parts of sugar require about 1.5 parts of ferment reckoned in the dry state; and as the analysis of ferment shows that about half of it consists of albuminous matter, it follows that $\frac{3}{4}$ of a part of albuminous matter are required for the conversion of 100 parts of sugar into alcohol and carbonic acid. Ferment consists of cells or globules of *torula* (q.v.), which are precisely the same in the production of wine and beer. It is the contents of these cells which contain the active albuminous matter; while the cell-wall, consisting of cellulose, $C_6H_{10}O_5$, and produced from gum or vegetable mucus, is inert.

The leading points in which the constituents of grape-juice and those of wine differ from one another in consequence of fermentation are, that in the wine there is a diminution (1) of the mucilaginous and saccharine matters, in consequence of the formation of ferment and alcohol; (2) of those substances which are insoluble in common water, but are held in solution in the viscid must, as, for example, phosphate and sulphate of lime; and (3) of cream of tartar, tartrate of magnesia, and sulphate of potash, which, being less soluble in spirit than in water, fall as the formation of alcohol increases. Red wines lose a portion of coloring matter and of the tannin, which is withdrawn by these salts, and hence become of a lighter color and less astringent. Before noticing the alcoholic strength of different wines we shall briefly describe the concluding steps necessary for rendering wine fit for use. The process of *clearing* is undertaken with the view of removing all the sediment in which albuminous matters may still occur, and of diminishing the coloring matter and tannin of red wines. Among the substances used for these purposes may be mentioned albumen, isinglass, gum, milk, lime, gypsum, etc. In warm countries gum is preferable to albumen or isinglass. The addition of lime throws down a precipitate of salts of lime, which carries down, in the case of red wine, a considerable quantity of coloring matter; its addition gives a sweeter and less astringent taste to the wine, and an appearance of age. As a general rule clearing increases the durability of wine. *Sulphurizing* is a process which is especially applied to sweet white wines which possess an excess of sugar and albuminous matter, and little tannic acid, and thus become easily decomposed. Its object is to check undue fermentation, and to prevent the formation of mold, which afterward imparts a musty taste to the wine. The process is effected by burning sulphur in bottles or casks, and instantly pouring in the wine, which absorbs the sulphurous acid. Wine intended for exportation to warm climates is usually strongly sulphurized. Of course great care must be taken that the sulphur is free from its common impurity, arsenic. In place of sulphurizing, another method of hindering the fermentation of sweet wine is adopted in some parts of France; it consists in putting $\frac{1}{1000}$ part of powdered mustard into the wine; but how it acts is unknown.

Having traced the chemical history of wine from its original state of grape-juice to the time when, having been clarified, and poured into casks and bottles, it is fit for use, we ought, in order to complete the sketch, to notice the subsequent changes which, in the course of time, it undergoes in the cellar. The ages at which different wines attain their perfection are, as is well known, extremely different. "As a general rule," says Mulder, "wines which have retained a considerable portion of albuminous matter, and possess but little tannic acid, cannot resist the influence of time; they become acid, or undergo some other change. This occurs in the case of Rhine wines, which contain but little alcohol; and all those wines which contain much sugar, or but little tannic acid, cannot be kept long. Wines which can be *cellared* are those which improve; or, to speak more correctly, those wines are stored which improve with age. In these odoriferous substances are formed, and the wine becomes less acid and better tasted. Such wine as is colored often deposits a considerable amount of sediment; and if it be stored in casks there is a constant increase of alcohol."—*Op. cit.*, pp. 105, 106. Wine is improved by being kept in wooden casks, as water escapes by evaporation, and the other constituents are relatively increased. The vinous constituents being thus concentrated exert a stronger chemical action upon each other, and render the wine not only stronger, but better flavored. The change, however, does not stop here. The loss of water must be replaced by the addition of wine, otherwise the action of the air would turn the wine sour, and convert the alcohol into acetic acid; and the diminution of water, which is thus replaced by wine, causes a constant increase of tartaric acid. Wines which are poor in sugar may thus soon become too sour; and consequently all wines cannot undergo this process. The popular idea that wine which has grown old in bottles has therefore become richer in alcohol is altogether false, and is doubtless founded on the fact that it is only the strongest wines that can be preserved. The color, however, of bottled wine is materially affected by age: liqueur-wines and red wines containing no large amount of tannic acid becoming darker, while wines which are rich in tannic acid, as port, for example, deposit a sediment, and become lighter. Old bottled wines contain odoriferous constituents—ethers of various organic acids—which are

not found in new wine. For an explanation of the mode of formation of these compounds, to which wine owes its *aroma*, we must refer to the chapter on "The Odoriferous Constituents of Wine" in Mulder's work; we will here merely remark that diminution of the free acids is necessarily associated with the formation of these compounds, and that this diminution can only occur by the acids being either decomposed or combined with non-acid substances, both of which operations here take place as the result of a very slow chemical process. This effect of time may, however, be imitated by art; and if bottles corked, but not quite filled with wine, are placed for two hours in warm water at a temperature of 185°, and after cooling are filled, their contents possess the flavor and aroma of wine that has been bottled several years. This result was originally obtained by Appert; but Pasteur and others have, during the last few years, again brought the subject before the French academy. Wines which have been long in bottle sometimes acquire a peculiar flavor, which is incorrectly referred to the cork. It is in reality due to the peculiar mold which grows from the outside of the cork inward; and should it reach the inner surface, it imparts to the contents of the bottle a peculiar taste; and this wine is said to be *corked*. Very similar to this is what is known as "the taste of the cask," a peculiar flavor sometimes acquired by wine before bottling. This flavor is regarded as dependent on the development of a peculiar essential oil, during the growth of "mold" on the surface of the wine. It can be removed by the addition to each pipe of about a quart of olive oil, which dissolves the unpleasant flavoring matter, and carries it to the surface.

In submitting matured wines to chemical analysis it is found that they differ materially from one another in their composition; and especially as the wine is, or is not, red. In white wine no special coloring matters are found, and only a trace of tannic acid; while in red wine both are present. In wine generally the principal ingredients are alcohol and water; then sugar, gum, extractive and albuminous matters; then free organic acids, such as tartaric, racemic, malic, and acetic acid; and salts, such as the tartrates of potash, of lime, and of magnesia, sulphate of potash, chloride of sodium, and traces of phosphate of lime; also, especially in old wines, substances imparting aroma, as œnanthic and acetic ethers, and other volatile odoriferous matters (among which Mulder mentions butyric and caprylic ethers, each having a pineapple odor, caproic, pelargonic, capric, and propionic ethers, amylic alcohol, and many of its ethers and other compounds, aldehyde, acetal, and probably racemic, citric, and malic ethers). In red wines, and in many others, a little iron, and possibly some alumina, may be found; and lastly, the best wines contain, according to Fauré, a peculiar matter, which he terms *œnanthin*, and to which he ascribes the substance or body of the wine; but which seems to other chemists scarcely to differ from gum or dextrine. These ingredients, as Mulder observes, vary exceedingly in proportion. The quantity of some is so small that the substance almost disappears during analysis; others can just be determined by a delicate balance; while others, again, are freely present. Putting aside taste and smell as standards of comparison, most of the essential dietetic and therapeutic properties of wine depend upon the *alcohol*, *sugar*, and *free acids*, especially *tartaric acid*, contained in it. In his chapter on "The Amount of Alcohol in Wine," Mulder gives a large number of analyses of different wines in which the percentage of alcohol is determined. We shall here only give the abstract of the analyses made by his translator, Dr. Bence Jones, who found that the alcohol varies in

		Per cent.		Per cent.
Port	from	20.7	to	23.2
Madeira	"	19.0	"	19.7
Sherry	"	15.4	"	24.7
Champagne	"	14.1	"	14.8
Burgundy	"	10.1	"	13.2
Rhine wine	"	9.5	"	13.0
Claret	"	9.1	"	11.1
Moselle	"	8.7	"	9.4
while in				
Brandy	there was	50.4	to	53.8
Rum	"	72.0	"	77.1
Geneva	"	49.4		
Bitter ale	"	6.6	"	12.3
Porter	"	6.5	"	7.9
Cider	"	5.4	"	7.5

Sugar is found in all wines,* although in certain kinds very little exists. According to Fresenius the sugar in four kinds of Rhine wine amounts to exactly six-sevenths of the extract remaining after evaporation, the seventh part consisting of the salts and non-volatile unfermentable matter. In red Bordeaux, on the other hand, very little sugar is found; red sauterne contains less than 1 per cent of extract, and hermitage 1.7;

* In the preceding foot-note we have mentioned that Dr. Bence Jones denies the accuracy of this statement.

hence the quantity of sugar must be very minute; while some kinds of muscat yield 24.5 of an extract, containing about 22 per cent of sugar. Small as is the quantity of sugar in some wines, it is of great importance in diminishing the sharp taste of the free acids, and in imparting an agreeable flavor to the wine. Good red wines should contain at least one-half per cent of sugar, and the quantity is sometimes larger. Some of the sweet wines contain nearly one-fourth of their weight of saccharine matter.

The following results were yielded by the experiments of Dr. Bence Jones:

Sherry (18 samples)	sugar in 1 oz. varied from	4 to 18	grains.
Madeira (9 samples)	" "	6 to 20	"
Champagne (4 samples)	" "	6 to 28	"
Port (8 samples)	" "	16 to 34	"
Malmsey Madeira	" "	56 to 66	"
Tokay	" "	74	"
Cyprus	" "	102	"

Under the term "free acids" are included the acid tartrate of potash, known as cream of tartar, and other soluble bitartrates found in wine, besides such acids as are quite uncombined, such as tartaric, malic, and acetic acid, and a trace of free tannic acid. Sugar has so much power in concealing the free acids, that their amount cannot be estimated with any certainty by the flavour of the wine, and must be estimated chemically by ascertaining how much of an alkaline solution of given strength must be used in order to render a given quantity of wine perfectly neutral to test-paper. Volatile acids, as, for example, acetic acid, may either be determined separately, or included with the others; and, excepting this acid, all the other acids occurring in wine may practically be calculated as tartaric acid. Mulder found that acetic acid was present in 20 different kinds of wine which he examined, the amount of the anhydrous acid ranging from 1.75 thousandth parts in Madeira to 0.25 thousandth parts in Tavella. In the same 20 kinds of wines, the free tartaric acid ranged from 2 to 7 parts in 1000 of wine, Tavella having the largest, and Bordeaux sauterne the smallest quantity. With regard to the tannic acid, traces of it may be found in all white wines, but in no white wine is it sufficiently abundant to be of the slightest importance in a medical or dietetic point of view. On the other hand, it is abundant in Port and heavily loaded Bordeaux wines, especially when new. In the course of time, this tannic acid becomes oxidized into a sparingly soluble compound, which is called by Berzelius the *apothema*, or precipitate of tannic acid—a process which is facilitated by the exposure of the wine in bottles to full daylight. There is no doubt that this acid, by combining with the albuminous matters, tends to increase the durability of these wines. Dr. Bence Jones, in his Appendix to Mulder's treatise, gives numerous results of experiments made regarding the acidity of wines by Prout, Liebig, Fresenius, and himself. His general conclusions are that, "proceeding from the least acid wine to the most acid, we have sherry, port, champagne, claret, Madeira, Burgundy, Rhine wine, Moselle. The least acid fluids examined were Geneva and whisky; then rum, brandy, ale, porter, stout. The wines were all more acid than the malt liquids." See also Dr. Druitt's work on *Cheap Wines*.

The recent decline in French vintages by reason of the phylloxera has developed a new wine-making industry in France. Enormous quantities of dried raisins are imported mainly from Smyrna and the East, are soaked in water for 40 or 50 hours, and then treated as fresh grapes. Every 100 kilogrammes of raisins so treated yield 325 litres of white or straw-colored wine, now recognized by the authorities as harmless; 30,000,000 kilogrammes of raisins and currants were used in 1880 in this way.

The most important diseases of wine are:

1. *The turning of wine.*—This disease is incidental to young wine, and seems to occur under special conditions of the weather. The color becomes darker, and the taste first disappears, and, if the disease goes on, becomes disagreeable; the wine becomes turbid and acid. This disease is caused by a decomposition of tartar.

2. *The ropiness of wine.*—This disease consists in the formation of vegetable mucus from the sugar of the wine, and is known as mucous fermentation. The wines liable to this change are those which are deficient in tannic acid.

3. *The bitterness of wine*—to which Burgundy wines are especially exposed—seems due to a second fermentation, inasmuch as a large amount of carbonic acid is evolved. It has been ascribed, whether correctly or not we cannot say, to the formation of citric ether, which is very bitter. The disease is caused by the sediment, and often ceases on being drawn off into other casks.

4. *The acidifying of the wine* depends upon the conversion of the alcohol into acetic acid, and may be stopped at its commencement by adding alkaline carbonates, which, however, destroy the colour, and affect the taste of the wine.

5. *The moldiness of wine* is a disease in which mold-plants are produced on the surface of the wine. How or under what conditions the mold is formed, is not known, except that the admission of air is favorable to the disease.

For further information on this subject, we may refer, *inter alia*, to Henderson's *History of Ancient and Modern Wines*, Bence Jones's translation of Mulder's *Chemistry of Wine*, and to the recent works of Shaw and Denman, in English; to those of Julien, Chaptal, Fauré (1844), and Batilhat, in French; and to those of Ritter, Balling, Von

Babo, Bronner, etc., in German; also to the chief works on technological chemistry in all languages.

Manufacture.—The mode of manufacturing wine varies in its details in different countries. Pagnierre, in his treatise *On the Wines of Bordeaux*, gives the following description of the manufacture of the superior clarets. The grapes, after being gathered, are picked, all that are likely to injure the quality of the wine being carefully removed. A principal vat of the best fruit, which is called the mother-cask (*cuve-mère*), is then made, into which, after picking, the workmen continue to put the best grapes, without their stalks, and without treading them, till they are from 15 to 20 in. deep; after which they throw about two gallons of old cognac or armagnac upon them, and then another bed of picked grapes, followed by two gallons more of brandy, and so on till the vat is full. Spirit of wine is then added, about four gallons being used for a wine-vat of from 30 to 36 tons. The amount of brandy and spirits that is added varies with the quality of the vintage, the better vintages requiring the less spirit. When there is a deficiency of saccharine matter in the grapes, starch-sugar is sometimes added. The *cuve-mère*, when filled, is closed and well covered with blankets to prevent the entrance of air, and is left in this state for about a month. A small cock or tap is placed in the side of the vat at about a third of its depth from the bottom, in order to allow of the progress of fermentation being observed; and to enable the manufacturer to know when the wine, having become cool and sufficiently clear, may be racked off and put into casks, previously prepared by scalding and rinsing with a little spirit. While the *cuve-mère* is at work, the ordinary vintage goes on as follows: The grapes are trodden or acted on by machinery in the press, and put with their stalks into the vats, when the fermentation takes place naturally. About a foot of the upper part of the vat is not filled, in order to leave space for the fermentation, which in very mature vintages sometimes occasions an overflow of these limits. The term *chapeau* is applied to the floating mass of stalks, seeds, and skins on the surface. The vats are lightly covered, and in from a week to a fortnight the wine is ready for being drawn off; for if it is left upon the lees (*marre*), or in contact with its crust (*chapeau*), it would take the disagreeable taste of the stalks. The barrels in which it is then placed are filled to about two-thirds or three-fourths, after which the *cuve-mère* is emptied, and its wine is poured in equal portions into these casks so as to fill them; and the remainder is used to replace every week what is lost by evaporation, or may have leaked away. All proprietors have not the means of making a *cuve-mère;* but in its absence, and with the employment of small vessels, wine of an inferior character is produced. The casks being full, are left unbunged for about a week, the bung-hole being in the meantime covered with a brick or piece of wood. They are filled up every two days, and after bunging, at least once a week, till the wine is in a state to allow the cask to rest with the bung-hole at the side, which is not till after a year and a half.

White wines are made in a somewhat different manner. The grapes are not, as in making red wine, put into the vat to ferment, but after the removal of the stalks, they are trodden, and when taken from the press, the juice, skins, and seeds are put into casks, in which the fermentation takes place, and wine is formed. When the fermentation has ceased, the wine is racked off from the barrels into smaller casks; and any loss that subsequently occurs from evaporation must be replaced once or twice a week.

The nature of the wine-press possesses many modifications. The wine-presses of the Jews consisted of two receptacles, or vats, placed at different elevations, in the upper one of which the grapes were trodden, while the lower one received the expressed juice or must (see Joel iii. 13). These vats were usually hewn out of the solid rock (Isa. v. 2 (margin), and Matt. xxi. 33). In Wilkinson's *Ancient Egyptians*, vol. i. p. 46, there is a figure of a wine-press thus composed of two vats or receptacles. In the process of treading, which seems to have prevailed from the earliest ages, the treaders were assisted by ropes fixed to the roof of the press. A certain amount of juice was allowed to exude from the ripe fruit by its own pressure before the treading began. This was kept separate from the rest of the juice, and formed the *gleucos*, or "sweet wine" noticed in Acts ii. 13. The first drops that reached the lower vat were called the *dema*, or tear, and formed the first-fruits of the vintage, which were to be presented to Jehovah (Ex. xxii. 29). Although the ancient system of treading the grapes still prevails in many countries, it is being gradually displaced by various mechanical appliances. In some parts of France, two wooden cylinders turning in opposite directions are employed to crush the fruit; and the reader will find accounts of more complicated presses in the various works on wine by Cyrus Redding and later authors.

Commerce.—The manufacture of wine has been carried on in all countries where the grape could be successfully cultivated, from the very earliest periods of history; and during the present century, it has followed the footsteps of man, and become established in the American and Australian continents, and promises to become, especially in the latter, a most important introduction. The vine, like most cultivated plants, is capable of producing very numerous varieties, and these, of course, give rise to different qualities of wine; but far more influence is exerted upon the quality of the wine by climate, soil, and the position of the vineyard as to the sun's influence; so that we not only have wines peculiar to particular countries, but of those, again, we have usually very numerous varieties, produced by special causes within those countries; and in addition to all

these, again, we have other differences, produced by the degrees of skill in the manufacture. The earliest wines of which we have any account were made in Asia, but of these we know very little. Later on, we find abundant evidence of the high esteem in which wine was held by the Greeks, Romans, and other civilized contemporary nations; and the name of one of the choicest Roman wines has continued in use till the present time, viz., the Falernian. From what we learn from Pliny and other writers regarding the extraneous additions made by the Romans to their grape juice, and the treatment of the interior of their casks, we should much doubt whether even Falernian would be appreciated by the English palate. See the article "Vinum" in Smith's *Dictionary of Antiquities*. The mediæval history of wine is involved in much obscurity; but we find such abundant mention of sack and canary, that although we are not quite clear as to the exact history of those wines, we are not left in doubt as to the high appreciation felt for them by the priesthood and nobility of those times. The Greek islands seem to have furnished a large portion of the wine then consumed in Europe, and the merchant ships of Venice in the days of her glory appear to have been largely engaged in carrying Greek and Italian wines. The Malmsey of those times was not the produce of Madeira, but of the islands of Tenedos, Lesbos, Chio, and Candia.

Burgundy is the oldest wine-producing country of central Europe, and centuries ago the wine of this province was the choicest to be found on the tables of the rich and noble. Much of the Burgundy of the present day has excellent qualities—being of good body, velvety, and of delicate bouquet. A few scarce kinds, such as the Romanée-Conti, are really splendid wines. Claret or red wine, for the English market, is chiefly the produce of the Medoc district. It begins below Bordeaux, on the left bank of the Gironde, and stretches almost to the bay of Biscay. White wine, or sauterne, is also produced in the same neighborhood. The general character of the Bordeaux wines, which are of all qualities, is crispness, elegance, and fine bouquet, and they improve by keeping. Sparkling wine of great renown is produced in the Champagne, the finest qualities of which sell at exorbitant prices; but it would appear that in no other corner of the earth can wine of the same high character be obtained. See Bordeaux, Burgundy, Champagne.

Germany produces fine white but very few red wines. They are best known in the British market as hocks and Moselles, and are made both still and sparkling. They have much elegance and a racy flavor, but many wine merchants think they have scarcely the value claimed for them; nevertheless their high price shows that they are much in demand. At the Vienna exhibition of 1873, the jurors on the wine section had before them a sample of Rhine wine made in 1706, the year in which Marlborough gained the battle of Ramillies, another coeval with the war of American independence, and another of the year of the battle of Jena. But all these and others made in the early part of the century, before the days of "fortifying," had lost their characteristic taste and flavor, and were but the phantoms of what they had been. See German Wines; Hochheim; Rhine Wine.

The vineyards of Austria are extensive, and produce a great variety of wines, which are mostly consumed in the country itself, the red Vöslauer being the kind principally exported. Hungary is still more a wine-growing country, producing considerably more than it consumes, and is the home of the renowned tokay (q.v.), which boasts a high antiquity, and commands a more fabulous price than any other wine in the world. Méneser-Ausbruch, Carlowitz, Ruster, Somlauer, and one or two others, are also favorably known. Hungarian wines are finding their way to English and other markets, but the long land-carriage operates as a serious check on the trade with England.

Perhaps the wines best known in Great Britain are the sherries of Spain and the ports of Portugal. The best kinds of the former are those technically called *dry*—that is, free from sweetness. Manzanillo is said to be the purest, but Montilla, Amontillado, and vino de Pasto are also famous kinds of sherry. This wine is chiefly shipped at Cadiz, near which it is made. The Malaga wines, both sweet and dry, are widely known, and from Catalonia come what are known in England as the Spanish reds. Port wine (q.v.) is mostly brought from Oporto, and its consumption in Great Britain has, as a rule, continued to increase for nearly two hundred years. The shipments of it had, however, fallen in 1858 to two million gallons; but from that time they gradually rose to the large annual total of seven million gallons in 1877. Portugal exported to Great Britain, in 1883, 3,101,766 gals. of wine (of all kinds). In the same year Spain exported to the United Kingdom 4,730,818 gals., valued at £1,202,186, a decided falling-off. Nearly all wines passing under the names of port and sherry are fortified, that is, dosed with brandy; but these form only a small portion of the wines produced in the Peninsula. Madeira, where twenty-five years ago the vineyards were almost totally destroyed by the oidium fungus, is now rapidly increasing the yield of its highly-prized wine.

Italy, with great natural advantages, is behind several other nations in the production of fine and especially of sparkling wines; but the Barolo of Piedmont, the Chianti of Tuscany, the Orvieto of the Roman states, the Lacryma Christi of Naples, and other special growths, have a high reputation. The celebrated Marsala, a wine with a sherry-like flavor, comes from Sicily. Not much Italian wine is exported, but the acreage occupied by the vineyards must be very large. The lesser wine-growing countries of Europe are Switzerland, Russia, Turkey, and Greece, which continues as in ancient

times to put resin in what is required for home consumption. Australia can already astonish the best French judges by the excellence of her wines, and the cape continues to yield her luscious Constantia and other growths of fine quality. The following table gives the annual yield of the more important wine-producing countries, but the great destruction caused in many districts since 1865 by the *phylloxera* (q.v.)—impairs the value of such a table:

	Gallons.
France, average from 1885–1890	114,000,000
Spain	450,000,000
Portugal, 1882	125,000,000
Germany, 1882	35,130,000
Austria—Hungary, 1883	76,430,000
Hungary, 1883	101,994,970
Italy	605,000,000

With respect to the high prices realized by old wines of famous vintages, we may state that as much as $10 per bottle has occasionally been given for port and Tokay; and on one occasion, a few years ago, two bottles of old Burgundy were sold at the very extraordinary price of $400 each.

Dietetic and Medical Value of Wines.—It may be laid down as a general rule that the use of wine, even in moderate quantity, is not necessary for young or adult persons enjoying good ordinary health, breathing fresh country air, and not exposed to overwork or any other abnormal depressing agency. As, however, life advances and the circulation becomes languid, wine in moderation becomes an essential, or at all events a valuable article of food; and even in earlier life the physician meets large numbers of townspeople, especially women engaged in sedentary occupations, who cannot digest the national drink, beer, which is admirably suited to our out-door laboring population, and to persons of higher rank who indulge freely in open-air exercises. In such cases the beer is replaced by the more grateful beverage tea, which, however, when taken too freely, and without sufficient solid food, gives rise to a form of distressing dyspepsia, which too often impels the sufferer to seek refuge in spirits. In many such cases cheap wine, which may be purchased in this country at from $0.40 to $0.50 a bottle, mixed with an equal bulk of water, will be found an excellent substitute for the beer or tea. We shall first notice the medical uses of those numerous cheap French, German, and Italian wines which have been during the last few years so prominently brought before the attention of the British public by certain enterprising wine merchants; and then briefly notice the uses of the more expensive wines, such as port, sherry, champagne, etc. In the first department of the subject we shall take Dr. Druitt's *Report on Cheap Wines* as our chief authority, and we shall regard as cheap wines those whose price does not exceed $0.75 a bottle. In prescribing wine, whether cheap or dear, the physician desires to give not merely alcohol, for that might be given far more cheaply under the form of gin or common brandy, but a compound liquid containing not only more salts or mineral ingredients than many a mineral water, but also the extractive parts of grape-juice, and the powerful oils and ethers which give to wine its special flavor or bouquet form of gin or common brandy, but a compound liquid containing not only more salts or mineral ingredients than many a mineral water, but also the extractive parts of grape-juice, and the powerful oils and ethers which give to wine its special flavor or bouquet and its singular exhilarating properties. "The distinctive elements of wine," says Dr. Druitt, "are to be had in abundance in cheap Bordeaux, Burgundy, and other French wines; in Rhine wine; in the Hungarian, Austrian, and some Greek wine; and in all with a natural and not injurious quantity of spirit. In prescribing *pure wine*—i.e., light natural, virgin wine—the practitioner has a perfectly new article of both diet and medicine in his hands."—*Op. cit.*, p. 22. In cases of debility and indigestion, such wine as that which we are now considering, diluted with cold water, may often be freely prescribed with great advantage in place of tea at breakfast, as well as at luncheon or dinner, or dinner and supper, according as the patient arranges his meals. The best of the cheap wines are those of Bordeaux: they are pure, light, and exhilarating; moderately strong, seldom containing 20 per cent of alcohol; free from sugar and other materials likely to induce gout or headache; and are admirably adapted, according to Dr. Druitt (who has experimented largely upon them), for children with capricious and bad appetites, for literary persons, and for all whose occupations are chiefly carried on indoors, and which tax the brain more than the muscle. They should be taken *at*, not *after*, meals; and in many cases, when judiciously prescribed, they will be of more service to patients suffering from anæmia, chlorosis, dyspepsia, or gouty or rheumatic tendencies, than any form of medicine. The Bordeaux wines are, moreover, of great use in relieving the restlessness, nightly wandering, and thirst that accompany scarlet fever and measles in children; one part of wine with one or two of cold water, according to age, being an excellent drink, acting at once as a diaphoretic, saline, and sedative. The Burgundy wines are fuller, stouter (on an average from 2 to 4 per cent stronger in alcohol), and higher flavored than the Bordeaux of equal price. The cheap Burgundies are inferior to the Bordeaux as medicinal agents; but the higher-priced wines (at and above 4s. a bottle) are of extreme service in cases of debility with nervous exhaustion, and, as Dr. Druitt remarks, "what Bordeaux is to the blood, that is Burgundy to the nerves." Some of the Hungarian wines which are being now introduced in America are excellent substitutes for Bordeaux; and not having the acidity, austerity, and cold-

ness of the latter, are often preferred by patients. Among the most important of the *dearer* kinds of wine are port, sherry, and champagne. Good old port is a tonic of great value in cases of fever and other forms of extreme debility; but many persons past 40 dare not take it if they have any predisposition to gout. Port wine given with warm water, administered with a biscuit at bedtime, often induces a good night's rest during convalescence from fevers or other weakening diseases. But during the last 30 or 40 years its price has risen from 30 to 100 per cent; and the port purchased at a vintner's by a poor invalid at $1. a bottle is usually nothing but doctored British spirit that has been sent to Hamburg to be transmuted into wine. In place of good port, now unattainable by the poor, the physician had better prescribe good native brandy if a strong stimulant be required, or such wines as the Hungarian Ofner or French Madeira, if it is the nutritive value of wine that is required. Sherry is, in a dietetic point of view, the wine in most general use in America, and if pure it agrees well with most constitutions. It is the only wine admitted into the pharmacopœia, in which it is employed in the composition of aloetic, antimonial, colchicum, and other medicated wines. It is a wine that suits the stomach in many cases of dyspepsia, but it is not often prescribed medicinally. Champagne is a wine that acts as a most valuable medicine in cases of vomiting, irritable stomach, etc., and when the appetite flags and there is great general debility. Genuine Tokay is so rare a wine that it is almost unnecessary to notice it; it is, however, when procurable extremely valuable as a cordial for aged persons of broken-down constitution. See American Wines, French Wines, German Wines, Greek Wines, Italian Wines, Portuguese Wines, Spanish Wines, Vine.

WINEBRENNER, John, 1797–1860; b. Md.; was originally a minister of the German reformed church, and had charge of four small congregations at Harrisburg, Penn., 1821; withdrew, 1830, with some other preachers, and formed a new sect, which they called the *Church of God,* but generally termed Winebrennerians (q.v.). The church has three positive ordinances, baptism by immersion, feet-washing, and the Lord's-supper. For several years Mr. Winebrenner edited the *Church Advocate.* He published *Regeneration; Brief View of the Church of God; Revival Hymn Book; Practical and Doctrinal Sermons.*

WINEBRENNERIANS, or The Church of God, a denomination of Baptists in the United States, organized, 1830, at Harrisburg, Penn., by John Winnebrenner, formerly a minister of the German reformed church. Their doctrines are a belief in the Bible as the authoritative revelation of God; in the trinity, in human depravity, in the vicarious atonement, the freedom of the will; they reject Calvin's doctrine of election; they consider faith and immersion essential to baptism; that the ordinance of feet-washing should be practiced by all Christians, and that the Lord's-supper should be often administered. The church has a domestic and foreign missionary society, and a printing establishment at Harrisburg, Penn. They had in 1890 several colleges, 560 churches, and 36,000 members.

WINES, Enoch Cobb, d.d., ll.d., 1806–79; b. N. J.; graduated at Middlebury college, 1827; took charge of Edge Hill school, Princeton, N. J., 1833; was made professor of languages in the Philadelphia high school, 1838; had a boarding school at Burlington, N. J., 1844–48; became a Congregational preacher, 1849; and was pastor at Cornwall, Vt., and Easthampton, L. I.; professor of languages in Washington college, Penn., 1853; president of St. Louis university, 1859; secretary of New York prison association, 1862; and of National prison association, 1870; went to Europe as a representative of the national government and assembled the first international congress on prison discipline, 1871–72; was chairman of a commission which met at Brussels, 1874, and at Bruchsal, 1875; made arrangements for a second international congress at Stockholm, 1877. Of his published works the principal is *Commentaries on the Laws of the Ancient Hebrews.*

WINFIELD, city and co. seat of Cowley co., Kan.; on the Walnut river, and the Atchison, Topeka, and Santa Fé, the St. Louis and San Francisco, and the Missouri Pacific railroads; 38 miles s.e. of Wichita. It is the seat of St. John's college (Luth.), and Southwest Kansas college (Meth. Epis.), and has a high school with library, Winfield Chautauqua assembly occupying Island park, street railroads, gas lights, waterworks, about 12 churches, several national banks, and daily, weekly, and monthly periodicals. The principal industry is farming. Pop. '90, 5184.

WINGATE, Charles Frederick, b. N. Y., 1847; for some time a N. Y. correspondent of the Springfield *Republican.* He was subsequently connected with the *Housekeeper,* which he founded, the N. Y. *Express,* the *Plumber and Sanitary Engineer,* and other journals. He became a consulting sanitary engineer in New York, and has been an active worker in the cause of civic improvement. He published *Views and Interviews on Journalism* in 1875.

WINGFIELD, John Henry Ducachet, d.d., ll.d., b. Portsmouth, Va., 1833; graduated at St. Timothy's coll., Md., 1850, and at the college of William and Mary, 1853. He was ordained priest in the Prot. Epis. church, 1859, and held several rectorships in the south until 1874, when he became rector of St. James's church, San Francisco. He was consecrated missionary bp. of Northern Cal., 1874.

WINKELMAN, Hermann, b. Germany, 1849. He adopted the profession of a singer after he had reached manhood. While singing in Darmstadt he was heard by Pollini,

of Hamburg, who brought him to the latter city. He became identified with Wagnerian drama, 1882, when he took the part of "Parsival" at Bayreuth, with such success that he was engaged by the Imperial opera at Vienna. Here he sang in Wagner's operas, with Mme. Friedrich-Materna and Herr Scaria. The famous trio made a tour of the U. S., 1884. He has a clear tenor voice of wide register and great power.

WINKLER, a co. in Texas; 800 sq.m.; unorganized; pop. '90, 18.

WINLOCK, Joseph, an American astronomer, was born at Shelbyville, Ky., Feb. 6, 1826, and died at Cambridge, Mass., June 11, 1875. On graduating at Shelby College in 1845, he became professor of mathematics and astronomy, but in 1852 he removed to Cambridge to become a computer of the *Nautical Almanac*. He was professor of mathematics in the navy, 1857–65; and of astronomy at Harvard, 1865–75, and director of the observatory, where he made many important improvements in astronomical equipments.

WINN, a parish in n.w. Louisiana, partly bounded on the e. by the Castor bayou, on the w. by the Saline bayou, drained by the Dugdemona river; 960 sq.m.; pop. '90, 7082. Parish seat, Winfield.

WINNEBAGO, a co. in n. Illinois, having the state line of Wisconsin for its n. boundary; 552 sq.m.; pop. '90, 39,938 of American birth, with colored; drained by the Rock river and its tributaries. Co. seat, Rockford.

WINNEBAGO, a co. in n. Iowa, having the state line of Minnesota for its n. boundary, drained by the head-waters of Iowa river; 408 sq.m.; pop. '90, 7325. Co. seat, Forest City.

WINNEBAGO, a co. in central Wisconsin, bounded on the e. by Winnebago lake, drained by Fox and Wolf rivers and large lakes in the n. portion; 460 sq.m.; pop. '90, 50,097. Co. seat, Oshkosh.

WINNEBAGO, a lake at the e. of Winnebago co., Wis., and entirely comprised within the state. Its area is about 212 sq.m., its length 26 m., and its greatest width 11 miles. The chief ports are Oshkosh, Fond du Lac, and Menasha; the lake is navigated by steamboats.

WINNEBAGOES, a tribe of Indians belonging to the Dakota family. They were, in early times, found about Green bay. Early in the 17th c. they were attacked by a strong alliance of other tribes, defeated, and terribly reduced in numbers. In the French and Indian war they were allies of the French, but during the revolution aided the British forces, and again in 1812. They took part in the Miami war, and were defeated by Wayne. In 1826–27 they made treaties fixing their boundaries, but intrusion on their territory was common; murder of whites followed, and by the treaty of 1832 they gave up all their lands on the Wisconsin and Fox rivers. A reservation was provided for them on the Mississippi, n. of the Iowa. They were removed again in 1846, not to the reservation promised them, n. of the St. Peters, but to one near the Wataub, a shameful transaction. In 1853 they were moved to Crow river, and in 1856 to Blue Earth, Minn., where they were advancing in civilization when the Sioux war broke out, and the whites urged their removal. Again they were taken to an unsuitable place, Crow creek, Dakota, and the greater part fled to the Omaha reservation. In 1866 they were given land at Winnebago, Neb., and in 1869 were placed under the charge of the Friends. They have since advanced greatly in civilization. They now number about 1500.

WINNER, Septimus, American song-writer, b. in Philadelphia. He studied the violin, pianoforte, organ, and other stringed and wind instruments, and began to teach music at the age of twenty. In 1847–57 he was a violinist in the Musical Fund orchestra and in various theaters in Philadelphia. In 1853 he established a music shop in Philadelphia, has been secretary and treasurer of the board of music trade, a manager of the Philadelphia musical fund, and for several years editor of the musical department of Peterson's Magazine. He has made more than 2000 arrangements of airs for the violin, guitar, and pianoforte, and has published numerous books of instruction for the pianoforte, violin, organ, violoncello, guitar, flute, banjo, accordion, clarinet, flageolet, cornet, and concertina. He is the author of the words and music to numerous songs, many of them written under the pseudonyms of "Alice Hawthorne," "Percy Guyer," "Mark Mason," and "Paul Stenton." Among the most popular are, *How Sweet are the Roses*, 1850; *What is Home without a Mother*, 1854; *Listen to the Mocking-Bird; Whispering Hope;* and *Give us back our old Commander*. His son, Joseph, has gained a reputation as a song-writer under the name of "Joseph Eadburn."

WINNESHIEK, a co. in n.e. Iowa, having the state line of Minnesota for its n. boundary, drained by the Upper Iowa, the Turkey, and other rivers; 696 sq.m.; pop. '90, 22,528. Co. seat, Decorah.

WINNIPEG, the largest of the lakes belonging wholly to the Dominion of Canada, lies 90 m. n. of the state of Minnesota, and about 350 m. n.w. of lake Superior, in lat. 50° to 54° n., 96° to 99° west. It is 275 m. long, 4–60 m. broad, has an area of 9000 sq. m., and lies 710 ft. above sea-level. It is connected by navigable channels with lakes Winnipegosis and Manitoba, which lie to the w., and run almost parallel with it. Its tributaries

drain an area of 400,000 sq.m. Of these the largest is the Saskatchewan (q.v.), which flows eastward from the Rocky mountains, through a rich alluvial country, and joins the lake near its northern extremity. The Winnipeg river, 300 m. long, and flowing in a north-westerly direction, connects lake Winnipeg with the lake of the Woods and Rainy lake. The Red river and its great branch, the Assiniboine, discharge their waters at the southern extremity of lake Winnipeg, after flowing through the region to the s. and s.w.—a region which presents a singular and important combination of prairie and woodland. Nelson river, issuing at the north end of lake Winnipeg, is its principal outlet, and connects it with Hudson bay.

WINNIPEG, the capital of the province of Manitoba, Canada, and one of the most important places in the Dominion, whether regarded in a material, political, or historical light, is situated at the confluence of the Red and Assiniboine rivers, the two principal streams of the province. Through the Red river, there is access to lake Winnipeg, and the city is entered by the Canadian Pacific, the Northern Pacific, the Great Northern, and the Manitoba and Northwestern railroads.

Fort Garry, as Winnipeg was originally called, was an old post of the Hudson Bay Company and was associated with the earliest days of trapping and fur-trading. The so-called fort was situated about 400 yards from the mouth of the Assiniboine, and in 1835 was replaced by a larger structure, now dismantled and almost obliterated, which was the centre of the colony of Assiniboia. The fort figures prominently in the history of that colony and of Manitoba, and is noted in later history as the place where Wolseley made his name, and as the seat of Louis Riel's short-lived government, 1869–70. The place had a civil population of 215 only, in 1870, and in 1873, when it was incorporated under its present name, it had less than 2000 inhabitants, but with the establishment of railroad communication in 1878, its prosperity increased rapidly. Up to 1870 the only communication with the nearest places of any size, St. Paul and St. Cloud, in Minnesota, was by carts, and in 1871 an irregular service was established by river in summer and by stages in winter. In 1881 an inflation of values in real estate occurred with subsequent depression, but in a few years the city began to prosper on a firm foundation. Considering its remoteness from the seaboard, it is remarkably cosmopolitan.

The city is irregularly laid out, except the old part contiguous to Fort Garry. Main street, 132 feet wide, was laid out by the government of Assiniboia in 1835 and was originally a colonist road. Portage avenue is another colonist road and both are winding. River Avenue is a favorite driving boulevard. The principal residence portion of the city is south of Portage Avenue, but there are many handsome residences in Fort Rouge, as the part of Winnipeg south of the Assiniboine is called. The city is the headquarters of the provincial government, and has the residence of the lieutenant governor, the parliament house, and the public departments of the province. One of the largest and most ornate buildings is the city hall, and the government offices, the post-office, the General Hospital, custom house, and several of the churches and banks are handsome. The University of Manitoba, situated here, includes Manitoba College (Presby.), St. John's College (Anglican), St. Boniface College (R. C.), and a medical college. The trade of Winnipeg is large, the exports being grains, vegetables, flour, fish, cheese, butter, and furs. There are numerous branch banks and several daily papers and other periodicals. There are large machine and engine shops and car works belonging to the Canadian Pacific railroad, lumber mills, flour mills, and other factories. St. Boniface, a town with over 1500 population, chiefly French, lies on the east bank of the Red river, opposite Winnipeg, and contains St. Boniface college, hospitals, and schools. It is connected with the city by an iron toll bridge. Winnipeg is the seat of bishops of the Anglican and Roman Catholic churches. The city is governed by a mayor and a board of twelve councilmen. The population in '81 was 7985, in '91, 25,642.

WINNIPEGO'SIS (or LITTLE WINNIPEG) **LAKE**, in the Dominion of Canada, emptying into lake Manitoba, s.e. of it, by Water Hen river; about 2000 sq. m.; Red Deer and Swan rivers, and lake Dauphin empty into it. Its length n. and s. is about 120 miles. It is shallow, navigable for vessels drawing 10 ft. of water.

WINNIPISEOGEE, or WINNEPESAUKEE, a lake in N. H., in Belknap and Carroll cos.; length, 25 m.; greatest breadth, 10 m. Its waters are discharged by the Winnepesaukee r., which unites with the Pemigewasset to form the Merrimack. The Merry-Meeting and Smith rivers are the largest streams which enter the lake, which is supposed to be also fed by springs at its bottom. The lake is irregular in outline, and near its shores are many steep and picturesque hills; the water is remarkably clear, but not deep, its greatest depth being 200 ft. At its outlet a dam has been erected to store the water for the manufacturing cities on the Merrimack, which raises it six ft. above its natural level of 472 ft. above tide. It is much renowned for the beauty of its scenery, which has been celebrated in the poetry of Percival and Whittier. An archipelago in the lake contains 264 islands, several of which are inhabited. W. is interpreted to mean The Beautiful Lake of the Highlands.

WINO'NA, a co. in s.e. Minnesota, having the Mississippi river on the n.e., separating it from Wisconsin, drained by the Minneiska and affluents of Root river; 630 sq. m.; pop. '90, 33,797, chiefly of American birth. Co. seat, Winona.

WINO'NA, city and co. seat of Winona co., Minn., on the Mississippi river, and the Burlington route, the Chicago and Northwestern, the Chicago, Milwaukee, and St. Paul, the Green Bay, Winona, and St. Paul, and the Winona and Western railroads; 104 miles s.e. of St. Paul. It is built on a level plain, and contains a U. S. government building ($150,000), public library (building erected by a citizen at a cost of over $40,000), high school ($60,000), public hospital, the First State normal school, St. Mary's academy, Winona seminary, commercial colleges, opera-house ($50,000), three iron railroad and highway bridges across the rivers, gas and electric light and electric street railroad plants, and waterworks, supplied by artesian wells and wells on the river bank. There are about 25 churches, several national, state, and savings banks, and manufactories of lumber, flour, wagons, carriages, and agricultural machinery. The city was settled in 1851, and chartered in 1857. Pop. '90, 18,208.

WINSLOW, EDWARD, 1595–1655; b. England; member of a good Worcestershire family. He was well educated, and while making a tour on the continent became acquainted with John Robinson, minister of the Independent church in Leyden, which had separated from the church of England. Winslow became a member of the Leyden congregation, and in 1620, with his wife and brother, sailed in the *Mayflower*. He was one of the party that landed at Plymouth. His wife died, March, 1621, and his marriage with Mrs. Susannah White was the first in New England. In 1623 and 1624 he visited England as agent of the Plymouth colony. He became a magistrate that year, went to England again in 1625, and was elected governor in 1633. While on a visit to England in 1635 he went before the council and prevented an attempt to destroy the self-government of the Plymouth colony. The same year he was imprisoned for 17 weeks by Laud on the charge of giving instruction in the church, being a layman, and of performing civil marriage. He was governor again in 1636 and 1644; visited England, 1646 and 1649, but did not return. He became one of the founders of the society for propagating the gospel in New England. In 1655 he was appointed by Cromwell one of three commissioners to take charge of an expedition against the Spaniards in the West Indies, but he died on the voyage. Among his works are *Good Newes from New England* (1624); and *Hypocrisie Unmasked* (1646).

WINSLOW, FORBES BENIGNUS, D.C.L., 1810–74; b. London; studied medicine in New York, then at the Royal college of surgeons, and at Aberdeen. He made a specialty of the treatment of insanity, and was for some time superintendent of a private asylum at Hammersmith. He then devoted himself entirely to consultation-practice in London. He founded in 1848 the *Quarterly Journal of Psychological Medicine and Mental Pathology*. Among his works are: *The Anatomy of Suicide* (1840); *Plea of Insanity in Criminal Cases* (1843); and *Obscure Diseases of the Brain and Disorders of the Mind* (1860).

WINSLOW, HUBBARD, D.D., 1799–1864; b. Vt.; graduated Yale college, 1825; studied theology, New Haven; pastor of First church (Cong.), Dover, N. H., 1828–31; of Bowdoin street church, Boston, 1832–44; traveled in Europe; principal of Mount Vernon young ladies' institute, Boston, 1844–53; edited the *Religious Magazine;* preached at Geneva, N. Y., 1857–59; pastor of 50th street Presbyterian church, New York, 1861. He published: *Controversial Theology; Young Men's Aid; Doctrine of the Trinity; Christianity Applied to our Civil and Social Relations; Intellectual Philosophy; Moral Philosophy; Appropriate Sphere of Woman; Relations of the Natural Sciences to Revelation.*

WINSLOW, JOHN A., 1811–73; b. N. C.; entered the navy as midshipman, 1827. In the Mexican war he took part in the attack on Tobasco as lieut. of the *Cumberland*. In 1861 he had command of the Mississippi flotilla, and was present at fort Pillow. In 1863 he took command of the *Kearsarge*, and in June, 1864, waited off the Cherbourg harbor for the famous confederate privateer *Alabama*, which came out from the neutral port in response to his challenge. The *Kearsarge* was protected by chain armor and met with little loss. The *Alabama* was sunk, and her capt., Semmes, escaped in an English yacht. Winslow was made commodore for this success, 1864, and rear-admiral in 1870.

WINSLOW, JOSIAH, 1629–80; b. Marshfield, Mass.; had command of the military band, and in 1656 captured Alexander, the son of Massasoit, and restored security to the colony. In 1675 he was appointed general-in-chief of the forces of the united colonies raised for king Philip's war, and held the position until 1671. He was governor's assistant in 1673, and the same year became governor of Plymouth.

WINSLOW, MIRON, D.D., LL.D., 1789–1864; b. Vt., a descendant of Kenelm Winslow, who came from England in the *Mayflower;* graduated at Middlebury college, 1815; Andover theological seminary, 1818; married Miss Harriet Wadsworth Lathrop of Norwich, Conn.; sailed for Jaffna, India, from Boston, June 8, 1819, as a missionary of the American board; with Mrs. Winslow he established the Oodooville seminary for girls, 1824. After her death he sailed for America in 1833, having in charge ten little girls, from the missionary families, sent for education to America. Returning, he established in 1837 the American mission in Madras. To the main work of preaching the gospel to the natives, and teaching and superintending native schools, he added the preparation of school and reading books in Tamil, assisted also in the translation of the Bible, wrote

some works on missions, and contributed occasionally to American and European periodicals. His chief literary work was a dictionary of the Tamil and English languages, completed in 1862. It was in part based on materials in manuscript left by the Rev. Joseph Knight of the London missionary society, and the Rev Samuel Hutchings of the American mission. It contained 67,452 words in both high or poetical, and low or common Tamil. It is said to be the most elaborate and complete dictionary hitherto prepared in any of the languages of India, except the Sanskrit lexicon of Prof. Wilson. Prompt and firm in judgment, dignified and courteous in manner, he commanded marked respect from the natives and from English officials in India. After 44 years' service in India, he died at the cape of Good Hope on his third voyage toward America.

WINSOR, Justin, b. Boston, 1831; graduated at Harvard, and continued his studies at Paris and Heidelberg. He was superintendent of the Boston public library, 1868–77, when he was appointed librarian of Harvard university. He was one of the most eminent librarians in the United States, and did much to increase the efficiency of libraries. Besides many bibliographical lists and catalogues he has written several books, and edited *The memorial History of Boston* (1880); *Narrative and Critical History of America* (1884–9); *Christopher Columbus* (1891); *The Mississippi Basin*, 1895). He died in 1897.

WINSTED, a borough in the town of Winchester, Litchfield co., Conn.; on Mad and Still rivers, and the New York, New Haven, and Hartford, and the Philadelphia, Reading, and New England railroads, 25 miles n.w. of Hartford. It has the Gilbert school, Gilbert school library, Gilbert home for the friendless (endowed with $400,000), Beardsley library, electric lights, national and savings banks, waterworks supplied from Crystal lake, Soldiers' memorial park and tower, Highland lake (3 miles long), and manufactories of knit goods, clocks, coffin trimmings, cutlery, spool silk, scythes, leather, shoes, edge-tools, etc. Pop. '90, 4846.

WINSTON, a co. in n. Alabama, drained by Sipsey creek, the Blackwater, and other small rivers; 630 sq. m.; pop. '90, 6552, chiefly of American birth, with colored. Co. seat, Double Springs.

WINSTON, a co. in central Mississippi, drained by the head-waters of the Pearl river; 640 sq. m.; pop. '90, 12,089, chiefly of American birth, includ. colored. Co. seat, Louisville.

WINTER, William, b. Mass., 1836; graduated at the Harvard law school; removed to New York in 1859; was a writer for *Vanity Fair*, memoirs of two of whose best known contributors, George Arnold and Fitz-James O'Brien, he has since published; he wrote the dramatic criticisms for the New York *Albion*, 1861–65. He has since been dramatic editor of the New York *Tribune*. He has published the poems *My Witness*, (1871); *Thistledown* (1878); *The Wanderers* (1888); *Poems* (1880). His verse has singular gracefulness and charm. His prose works include: *Edwin Booth in twelve characters* (1871); *The Trip to England* (1879); *The Jeffersons* (1881); *English Rambles* (1883); *Henry Irving* (1885); *Shakespeare's England* (1888); *Gray Days and Gold* (1891); *Life and Art of Edwin Booth* (1894).

WINTERBERRY, a name applied to two species of *ilex*, *I. verticulata*, or black alder, and *I. lævigata*, or smooth winterberry, and therefore closely related to *I. Glabra*, or inkberry (q.v.) and *I. cassine*, or yaupon, and to the holly (q.v.), *I. opaca* (Gray). Indeed they all belong to the holly family (*aquifoliaceæ*). See Holly. The common winterberry, or black alder, has obovate, oval or wedge-lanceolate leaves, serrate, downy on the veins beneath; flowers, which appear in May and June, are all very short-peduncled. It grows on moist, preferably rich ground, from 6 to 12 ft. high, bearing in November great quantities of brilliant crimson or scarlet-crimson berries, which are often gathered and used as vase ornaments or wreaths. If carefully dried they retain much of their brightness for some time. The smooth winterberry (Gray) has lanceolate or oblong-lanceolate leaves, pointed at both ends, shining above, beneath mostly glabrous. It grows in wet grounds from Maine to the mountains of Virginia.

WINTERGREEN, the popular name of plants of the genera *pyrola* and *chimaphila*, of the natural order *pyrolaceæ*, which, according to some botanists, is a sub-order of *ericeæ*, distinguished chiefly by difference of habit, but also by declinate styles, seeds with a loose-winged skin, and a minute embryo in the base of fleshy albumen. Only about twenty species of *pyrolaceæ* are known. They are natives of woods throughout the whole of the northern hemisphere, and are herbaceous or half-shrubby plants, with a corolla of four or five segments, which are almost petals, but are slightly united at the base. Several species of *pyrola* are natives of America, perennial herbaceous plants, with flowers of some beauty. Two species of *chimaphila*, half-shrubby plants, with beautiful evergreen leaves, natives of North America, *C. umbellata* and *C. maculata*, are valued for their tonic, diuretic, and narcotic qualities, and are used in dropsy, calculus, strangury, and other diseases.

WINTERGREEN, Oil of, or *gaultheric acid*, is an essential oil yielded by the flowers of the *Gaultheria procumbens* (see Gaultheria), abundant in New Jersey, and consisting chiefly of methyl salicylate, $CH_3 \cdot C_7H_5O_3$, mixed with a small quantity of a hydrocarbon, termed *gaultherilene*, which is isomeric with oil of turpentine, and which, being more volatile than the salicylate of methyl, is easily separated from it. The salicylate of

methyl is much the more abundant constituent of the oil (see SALICYLIC ACID). This oil is not only yielded by the distillation of other plants, as the leaves and flowers of *monotropa hypopitys*, and the bark of *betula lenta*, but may be artificially formed by distilling a mixture of 2 parts of crystallized salicylic acid, 2 of anhydrous wood-spirit, and 1 part of oil of vitriol. In whatever mode it is obtained, it presents the appearance of a colorless or yellow oil, of a powerful, agreeable, and persistent odor; and hence it is largely used in perfumery.

WINTERHALTER, FRANZ XAVER, 1805–73; b. Baden; studied art at Freiburg and Munich, and in Italy. He became a fashionable portrait painter, and among his sitters were queen Victoria, the prince of Wales, and the empress Eugénie. He also painted groups of the royal family of England and of the French court. Of his pictures other than portraits "Dolce far niente" and "Roderick the Goth seeing Florinda for the First Time," are generally considered the best.

WINTER MOTH *Cheimatobia brumata*, a species of moth, the caterpillar of which is very injurious to plum trees. It has long been well known as common in many parts of the continent of Europe, and has of late begun to be very abundant also in some parts of England, as in the vale of Evesham, in Worcestershire, celebrated for its plum plantations, where damage has been done by it to the extent of £20,000 or £30,000 in a year. It is an insect about half an inch long, of a light-brown color. The male alone has wings; the female, as in a few other moths, is wingless. The eggs are hatched early in spring, and the caterpillars, at first very minute, feed upon the buds of the plum. The eggs are deposited on trees, chiefly around the base of the buds, and in chinks of the bark. Like most of the moths, this insect is nocturnal in its habits. It is during night that the males fly about the trees, and the wingless females creep up their stems. The best mode of preventing its ravages is to surround the stems of the trees with something over which the females cannot climb from the ground, in which they pass their chrysalis stage. Boxes are used for this purpose in Germany, in which the ascending insects are trapped. A more easy method is to coat the trees with a composition of tar and greese in the beginning of winter, the time at which these moths appear in their perfect state, and when, of course, the laying of eggs takes place. By visiting the plantation of plum trees with a lantern at this season, the gardener is often also successful in killing great numbers of them.

WINTER'S BARK, a stimulant, aromatic, and tonic bark, resembling cinnamon, and used for the same purposes. It derives its name from capt. Winter, who first brought it from the strait of Magellan in 1579. It is the produce of *drimys Winteri*, a native of some of the mountainous parts of South America, and abundant in the lower grounds of cape Horn and Staten island—an evergreen shrub with laurel-like leaves, corymbs of white flowers, and many-seeded berries. This shrub belongs to the natural order *magnoliaceæ*, and to a section of it which has by some been constituted into a separate order, *Winteraceæ*, chiefly distinguished by dotted leaves and aromatic qualities. The star anise (*illicium*) is nearly allied to it. The bark of other species of *drimys* has similar properties to Winter's bark, as that of *D. granatensis*, much used in Brazil as a remedy for colic, and of *D. axillaris*, a New Zealand tree.

WINTERTHUR, one of the most industrious and beautiful of the smaller towns of Switzerland, in the canton of Zurich, stands on the Eulach, 13 m. n.e. of Zurich. Its situation among hills, many of which are clothed with vines, is specially pleasant. Cotton-spinning, cotton-printing, dyeing, and the manufacture of machinery and weapons, are actively carried on. Pop. '88, 15,805.

WINTHROP, FITZ JOHN, 1638–1707; b. Ipswich, Mass.; son of Gov. John of Conn.; educated in England. He held a military commission under Richard Cromwell, but at the restoration returned to Connecticut; served in king Philip's war; was a member of Governor Andros's council, and a magistrate, and in 1698 was appointed maj.gen. of the Canada expedition. From 1693 to 1698 he was the British agent in the colony, and gave great satisfaction. From 1698 until his death he was governor of Connecticut.

WINTHROP, JAMES, LL.D., 1752–1821; b. Mass.; graduated at Harvard, 1769, where he was librarian, 1772–87. He was wounded at Bunker Hill. After the revolution he was chief justice of the state court of common pleas. He wrote books in regard to Scriptural prophecies, and was a contributor to the *Literary Miscellany*.

WINTHROP, THEODORE, 1828–61; b. New Haven, Conn.; graduated at Yale college. He spent some time in a New York counting house, and at Panama. He accompanied Lieut. Strain's expedition to the isthmus of Darien, suffering hardships which seriously impaired his health. He afterward practiced law for a short time in St. Louis, but soon returned to New York. He now wrote tales and stories, none of which were published until after his death. Early in 1861 he went to Washington with the 7th New York regiment. He was soon made military secretary to Gen. Butler, with the rank of maj. He was killed at the battle of Big Bethel, June 10, 1861, at the head of the assault upon the confederate left. His works, of which a complete edition with a memoir by his friend George William Curtis, has been published, are: *Cecil Dreeme; John Brent; Edwin Brotherloft; Canoe and Saddle;* and *Life in the Open Air*.

WINTHROP FAMILY.—John, governor of the colony of Massachusetts, was born in Groton, county of Suffolk, England, Jan. 12, 1588; was bred to the law, appointed justice of the peace at the age of 18, and on account of his excellent and pious character, was, in 1629, elected by the governor and company of Massachusetts bay to govern their colony. He sold his estate, and April 7, 1630, sailed from Yarmouth with 900 persons. During the voyage he composed an essay, entitled *A Model of Christian Charity*. He was re-elected governor every year until 1634, when he became deputy-governor under sir Harry Vane, with whom he had an animated controversy on the doctrines of Mrs. Hutchinson. In 1637 he was elected over sir Harry, and continued governor, with a brief interval, during his life, and had more influence probably than any other man in forming the political institutions of the northern states of America. He was opposed to an unlimited democracy, for he said, "The best part of a community is always the least, and of that best part the wiser part is always the lesser." He kept a journal up to 1649, two books of which were published in 1790; and the third, found in the New England library, kept in the tower of the Old South church in Boston, in 1816. A revised edition was published at Boston, in 2 vols. (1825–26). He died at Boston, Mar. 26, 1649. —John, governor of Connecticut, son of the preceding, was born at Groton, England, Feb. 12, 1606; educated at Trinity college, Dublin; made the tour of Europe; went to America in 1631, was chosen a magistrate in Massachusetts, but returned to England; and in 1635 went to Connecticut, built a fort at the mouth of the Connecticut river, was made governor of the colony, and founded the city of New London in 1646. He obtained a charter for the colony from Charles II., and was first appointed governor under it; and, in 1676, represented his colony in the congress of the united colonies at Boston. He was a man of eminent virtues, and considerable acquirements. Some of his papers are contained in the *Philosophical Transactions*. He died at Boston, April 5, 1676.—John, ll.d., American scholar, a descendant of the first Governor Winthrop, was born in Massachusetts, 1714; graduated at Harvard college, 1732; and in 1738 was appointed Hollis professor of mathematics and natural philosophy. In 1740 he observed the transit of Mercury; and, in 1761, went to Newfoundland to observe the transit of Venus. He published tracts on earthquakes, comets, and other astronomical subjects. Died at Cambridge, May 3, 1779.—Robert Charles, ll.d., American statesman and orator, descendant of the sixth generation from the first governor Winthrop, was born at Boston, May 12, 1809, graduated at Harvard college in 1828, studied law with Daniel Webster, and was admitted to the bar in 1831, but soon abandoned law for politics, and was elected to the state legislature in 1834, where he served five years, three as speaker of the house. In 1840 he was elected to congress, of which he was a member for ten years. In 1847 he visited Europe, and was the whig candidate for speaker, but defeated after a balloting of three weeks. In 1850 he succeeded Mr. Webster, who became secretary of state, as senator from Massachusetts, a place in which he was succeeded by the more radical Charles Sumner. He was also defeated as a candidate for governor of Massachusetts. He published *Life of J. Winthrop, Memoir of N. Appleton* (1861); *Speeches* (1853–67); and *Washington, Bowdoin, and Franklin* (1876). He died 1894.

WIRE and WIRE-DRAWING. The facility with which any metal can be drawn into wire depends upon its ductility. Most metals have this property; but some, like bismuth and antimony, are so brittle that they can only be drawn out with difficulty, and wire made from such metals is useless, from want of tenacity. See Ductility.

Metals largely used for making wire, such as iron, brass, and copper, are drawn by essentially the same process. We may take iron as an example. It is prepared by cutting up flat rolled plates into square rods of a given thickness. This is done by means of a pair of slitting rollers; one of these has grooves, equal to the breadth of the rods wanted, fitting into corresponding grooves in the other, which cut up the metal like scissors. The rods are cleaned of scales of oxide, either by mechanical rubbing, or by chemical treatment with dilute sulphuric acid. If the rod is thick, it has its square edge taken off by rollers. It is then drawn into wire by forcing it through the hole of a *draw-plate*. This is an oblong piece of hard steel pierced with conical holes, gradually diminishing in diameter, and having the smallest ends of these tapering holes carefully prepared to the required size. Sometimes cubical shaped dies, each with a single trumpet-shaped hole, are used. Motion is given to the drawing-block or cylinder by means of beveled wheels connected with a shaft driven by steam or water-power.

The workman commences by making a point on the rod, so as to allow it to pass through the hole, and be grasped by a pair of pincers attached to a chain, which draws it out till the length is sufficient to pass round the cylinder. This much is done by hand, and then the cylinder, being put in gear, is made to revolve and pull the wire through the draw-plate—coiling it round itself as the drawing proceeds. After being once drawn, it is again passed through a smaller hole, and so the process is repeated till it has been reduced to the size required. Fine wire may require from 20 to 30 drawings. The cylinder revolves slowly with a thick wire, and the speed is increased as the size diminishes. After being passed a few times through the draw-plate the metal becomes brittle, and requires to be annealed. Sometimes, a lubricating substance—as wax, grease, or soap—is employed during the drawing, especially for fine wires.

For some very accurate purposes, such as chronometer springs, and for gold and silver lace, the wire is drawn through jeweled holes, that is, holes perforated in rubies and other hard gems. A silver wire 170 m. long, and about $\frac{1}{300}$ of an inch in diameter, has been drawn through a hole in a ruby, and found, by a micrometer, to be of exactly the same size at the end as at the beginning; whereas the drawing of a length of 16 m. of brass wire through a steel draw-plate necessitates a readjustment of the hole.

Platinum wire can be drawn as thin as $\frac{1}{3000}$ of an inch in diameter by first encasing it in silver, drawing down the compound wire, and then dissolving off the silver with nitric acid. By the same process gold wire can be obtained only $\frac{1}{5000}$ of an inch in diameter. It has been shown by Babbage, as an illustration of how greatly labor increases the value of a raw material, that one pound of iron, which costs twopence, will yield 50,000 wire pendulum springs for watches, each weighing about one-seventh of a grain, and selling at the retail price of twopence.

Wire, although mostly cylindrical in form, is drawn of many different sections, such as oval, half-round, flat, triangular, molded, and the grooved pinion-wire from which the small toothed pinions for clocks and watches are cut. Copper wire of different forms is used to form patterns in the blocks used by calico printers.

The following table (given by Dr. Tomlinson) of weights, omitting fractions of a pound, which were sustained by wires 0.787 of a line in diameter, shows the comparative tenacity of a few of the metals: Iron, 549 lbs.; copper, 302 lbs.; platinum, 274 lbs.; silver, 187 lbs.; gold, 151 lbs.; zinc, 110 lbs.; tin, 35 lbs.; lead, 28 lbs. It may be remarked here that some kinds of brass wire have been noticed to become extremely brittle in the course of time, especially if subjected to vibration, and even to break when used to support objects, without any assignable cause.

The quantity of wire used in various manufactures is something enormous, and of late years numerous articles of woven wire, such as mats, baskets, etc., have become very common. Fence wire is now in use all over the world, the two principal kinds being a twisted wire of several strands from which sharp points stick out radially, called barbed wire, and an oval wire which is wavy in the plane of the largest diameter. The telegraph, telephone and electrical work in general have added enormously to the consumption of iron and copper wire.

WIREPULLER. The person who controls by secret wires the movements of a puppet, or doll; hence the term is applied to any secret influence or management to give effect to a desire; political intrigue for party purposes, elections, etc.

WIRE-ROPES have come greatly into use of late years for winding purposes in mines and on inclines, for the rigging of ships, and for numerous engineering contrivances; also for the construction of electric-telegraph cables. They are almost alway "galvanized," that is, coated with zinc. A hemp rope 6 inches in circumference, and weighing 9 lbs. per fathom; an iron-wire rope $2\frac{3}{8}$ inches in circumference, and weighing 5 lbs. per fathom; and a steel-wire rope $1\frac{7}{8}$ inch circumference, and weighing 3 lbs. per fathom, are all of equal strength—the breaking strain of each being 10 tons.

WIRE-WORM, a name given by farmers and gardeners to the larvæ of click beetles (q v.), which are long and hard, and often swarm in corn fields, gardens, and pastures, feeding on the roots of crops, and doing great mischief. The best known British species are *elater* or *agriotes lineatus*, *E.* or *A. obscurus*, and *E.* or *A. sputator*. The first of these, which is the largest, is in its perfect state about half an inch long, with brown head and thorax, clothed with cinereous down; the elytra tawny, striped with brown. The larva, when full grown, is fully half an inch long, very narrow, yellowish, hard, and shining, the jaws tipped with black. The second species named is in its perfect state of an earthy-brown color. The third has a black head and thorax, with many dots, the elytra light brown, with dotted lines. It is only about a quarter of an inch in length. Wire-worms are very small when first hatched, and are said to live for years in the larva state. Moles, rooks, and pheasants are useful in destroying them. Clover crops are said to have the effect of increasing their numbers. Farmers and gardeners resort to various means in order to get rid of this pest, as hard rolling after a top-dressing of lime, and mixing spirits of tar, gas-lime, or rape-cake with the soil; but one of the most effectual is the strewing of slices of potatoes or turnips on the ground, under which they soon congregate, and great numbers are thus easily destroyed.

WIRT, a co. in w. West Virginia, bounded on the n. by Hughes river; drained by the Little Kanawha; 290 sq.m.; pop. '90, 9411. Petroleum is largely exported. Co. seat, Elizabeth.

WIRT, WILLIAM, LL.D., 1772–1834; b. Md.; son of a Swiss father and a German mother. He began to practice law at Culpeper Court-house, Virginia, in 1792; 7 years later he was elected clerk of the Virginia house of delegates. For a short time in 1802 he was chancellor of the e. district of Virginia, but he soon resigned. Removing to Richmond in 1806, he gained high reputation at the bar in the trial of Aaron Burr in 1807. He represented Richmond in the house of delegates, 1807–8, where he was a warm supporter of Jefferson. In 1816 he became U. S. attorney for the district of Virginia, and he was attorney-gen. of the United States, 1817–29, when he settled in Baltimore. In 1832 he received the anti-masonic nomination for president of the United

States. His *Letters of a British Spy*, containing sketches of popular orators, appeared in the *Argus* for 1803. Better known is *Life of Patrick Henry* (1817).

WISBECH, or WISBEACH, a market t. in Cambridgeshire, in the isle of Ely, occupies a position of importance in the Fen district, on the Nen, 40 m. n. of Cambridge. Wisbech is a busy and prosperous place. Its principal buildings are the church of St. Peter and St. Paul, lately restored; the corn exchange, the town hall, the cattle market, and the new schools. Wisbech is connected with the Great Eastern, the Great Northern, and the Midland railways. By the Nen, which falls into the Wash, at the distance of 12 m. below Wisbech, communication is maintained between this town and the North sea. The navigation of the river has been much improved within recent years, and Wisbech is considered the port of Cambridgeshire. It is generally well built, contains a number of useful institutions, and carries on rope-spinning, brewing, and general trade. Corn, timber, wool, salt, and seeds are exported; wine, deals, oil-cake, corn, slates and coal imported. Vessels of upwards of 500 tons can ascend from the Wash. Pop. '91, 9395.

WISBY, a once famous seaport of the Swedish island of Gothland (q.v.), capital of the island, and situated on its w. coast, about 130 m. s. of Stockholm. It is of the highest historical and antiquarian interest; and though the time of its foundation is unknown, it was during the 10th and 11th centuries (200 years before the establishment of the Hanseatic league in 1241) one of the most important commercial cities in Europe. It was a principal factory of the Hanseatic league during the 14th and 15th centuries. The eastern trade, which during the 11th and 12th centuries passed through Russia, and thence down the Baltic to Gothland, centered in Wisby, and greatly enriched that port. In 1361 Valdemar IV. of Denmark took the town by storm, and, plundering it, obtained an immense booty. This was a fatal blow to the prosperity of the place. The architecture of Wisby is exceedingly interesting. Its ancient feudal walls and towers exist in almost as entire a state as they were in the 13th c., and render its appearance, as seen from the sea, exceedingly striking. The early grandeur of the town is attested by the fact that it contains, well preserved, the remains of 18 churches, all of which date from the 11th and 12th centuries, are varied in form and ornament, and are a mine of interest to the student of early Gothic. The oldest is the church of the Holy Ghost, built in 1046. Of late it has begun to recover, and promises to regain some of its former prosperity. Pop. '91, 7102.

WISCHEHRAD (old Slav. and Bohem. *wyschehrad*, Pol. *wyszogrod*) is the name of numerous towns and castles in all Slavonic countries, e.g., the original residence of the princes of Bohemia, now a quarter of the city of Prague. The word is composed of the root *wys* or *wysch*, high, and *hrad* (Rus. *gorod*, Pol. *grod*, in some dialects *grätz*), a fort, castle, town. *Hrad* is from the same root as Ang.-Sax. *hreod*, Eng. *reed*, *rod*, another form being *yerde* or *yard*. It signified primarily a place defended by rods or poles, a palisaded fort, and hence a town. See TON.

WISCONSIN, a river of Wisconsin, rises in the northern center of the state, and flows s. and w. to join the Mississippi. Length, over 600 m. A canal from Portage City connects with the Fox river; so that there is steamboat communication between lake Michigan and the Mississippi.

WISCONSIN, a northern lake-state, lying between lat. 42° 27′ and 47° n. and long. 86° 53′ and 92° 54′ w., except the Apostle islands in lake Superior and the islands off the north-east coast in lake Michigan. The state is bounded on the north by lake Superior and the Upper Peninsula of lake Michigan; on the south by Illinois; on the west by Iowa and Minnesota, with the Mississippi and St. Croix rivers as a partial boundary line; and on the east and north-east by lake Michigan and the Upper Peninsula. Its length from north to south is 300 miles; its extreme breadth, 250 miles; and its coast line, over 500 miles. Its land area is 54,450 sq. miles; its gross area 56,040 sq. miles, or 35,865,600 acres. The name Wisconsin was taken from that of its chief river, the word being an Indian one of doubtful etymology, though generally identified with the Chippewa *Wishkosisibi*, "Prairie River." The state is popularly styled "the Badger State," though the badger is only seldom found within its limits. Wisconsin stands seventeenth among states in the order of their admission to the Union.

TOPOGRAPHY.—Wisconsin, for the most part, is a great plain, varied only by the cliffs bordering the rivers and lakes, and elevated from 600 ft. to 1500 ft. above the ocean. The highest lands are those along the sources of the tributaries of lake Superior, which, near the Montreal river, are 1700 ft. to 1800 ft. above the sea, gradually diminishing westward to about 1100 ft. at the western line of the state. From this great water-shed the land slopes rapidly toward the lake, and more gradually toward the south to the lower Wisconsin river, whence there is another slope toward the south, drained mostly by the waters of Rock river and its tributaries. In the southwestern part of the state are elevations called "mounds" of considerable height. These are Blue Mound, in Dane county, which is 1700 ft.; Platte Mound, in Grant county, 1281 ft.; and Sinsinawa, also in Grant county, which is 1169 ft. above the sea. The rivers which discharge their waters into lake Superior are the Montreal, Bad river, Bois Brûlé, and St. Louis. They are all short, and have a descent of about 800 ft. in a length of 30 or 40

miles. The Menominee, Peshtigo, Oconto, Pensaukee, and Fox or Neenah rivers run into Green bay. The last named is an important stream, rising in Green lake, and flowing so near the Wisconsin river that a short canal connects the two, and makes navigation possible between Green bay and the Mississippi. Other rivers are the Kewaunee, Manitowoc, Sheboygan, and Milwaukee, which are tributaries of lake Michigan. The Mississippi, as stated above, forms a part of the western boundary of the state, and receives within the state the St. Croix, Chippewa, Buffalo, Trempealeau, Black, and Wisconsin rivers, as well as several smaller streams. The coast-line on lake Superior and along lake Michigan aggregates over 500 miles. Northern Wisconsin resembles Minnesota in the number and character of its beautiful lakes. Winnebago is 26 m. long and 10 m. wide, and Geneva and Devil's lakes are of considerable size. The Wisconsin, St. Croix, and other streams pass through deep gorges called "dalles," and noted for picturesque scenery. The St. Louis falls 320 ft. in 16 m., and the Menominee 134 ft. in 1½ m.

The scenery of Wisconsin is romantic and abounds in many picturesque and striking features. The deep-cut Rood's Glen and Witches' Gulch near Kilbourn; the imposing Fortification rock and the cliff on lake Pepin; the falls of the Chippewa river; and, above all, the hundreds of little lakes embowered in dense forest or green fields afford the most exquisite studies for the artist. Many of these are deep set in bowls of rock over whose brim the crystal tide washes unceasingly. The largest of these lovely lakes is Winnebago, and, besides those already mentioned, others notable for their great beauty are Green lake, Lauderdale, Elkhart, Delavan, Pewaukee, Spring, Oconomowoc, and the four lakes at Madison.

Mineral springs of great repute are those at Waukesha, 20 miles n.w. of Milwaukee, and now a famous summer-resort. Here is the Bethesda spring, and in connection with it, the Bethesda Baths, open from June to October. Other springs are at Beaver Dam (the Vita springs); and at Madison.

The Apostle islands in lake Superior, which cover some 200 square miles, are included within the state of Wisconsin.

History.—The territory now comprised within the limits of the present state was once inhabited by the mysterious race known as the Mound Builders, whose works in the shape of rude fortifications and tumuli of earth are still to be seen in many places. Many of these structures are made to imitate the human figure, or are in the shape of animals. The more remarkable are in Jefferson county, where a space of nearly 18 acres is enclosed by a wall of earth and burnt clay, with buttresses and mounds. Remains of pottery, flint arrow-heads, and pipes and axes of stone are also found, besides beads and amulets, and tools of hardened copper. No other state possesses so many relics of the prehistoric race, if such indeed it be,—for the United States Bureau of Ethnology has put forth the statement that these various works are to be ascribed to the ancestors of the Winnebagos (the old Dakotas) rather than to a people of different ethnic relations.

In 1634, the Sieur de Frontenac, governor of New France, sent one Jean Nicolet into this territory with directions to induce the Indian tribes dwelling there to enter into commercial dealings with the French of lower Canada. Nicolet ascended the Fox river and then proceeded south through Illinois. In 1658–59 two other Frenchmen, Radisson and Groseilliers, visited Green bay in search of furs, and appear to have descended the Wisconsin river to the Mississippi. In 1661 these traders built a small stockade near the present town of Ashland. In 1665 the priest Father Allouez established a mission at La Pointe on Chequamegon bay, near Radisson's stockade. Depere on the first rapids of Fox river became an important trading station for furs, and was visited by Joliet and Marquette in 1673. Other famous explorers, such as La Salle in 1679, Du Luth and Father Hennepin in 1680, and Nicholas Perrot in 1685, penetrated the rivers and bays of Wisconsin. In 1689, Perrot, who had been made by the French governor, commandant of the west, erected forts on lake Pepin, Prairie du Chien and elsewhere. In 1692, Le Sueur built a stockade at La Pointe. For more than a century, the French and their Indian allies held undisputed possession of the territory, and from it sent out many expeditions against the English settlements further east. It was, in fact, one of these Frenchmen, Langlade, who planned and executed the ambuscade into which Gen. Braddock fell in 1755. When the English gained possession of Quebec, and with it the control of Canada (1763), Wisconsin was united with Canada by George III., though in all externals it still remained essentially French. With the whole Northwest, it was ceded to the United States at the end of the Revolution, by the treaty of 1783, yet the American government took no definite steps toward assuming possession of it until the time of the war of 1812–15. From 1800 until 1809 it had been regarded as a part of Indiana territory; from 1809 until 1818 it was a part of Illinois, and from 1818 to 1836, of Michigan. In the last named year, Wisconsin territory was organized as a separate government, including at that time Iowa, Minnesota, and a part of what was afterward the two Dakotas.

The advent of American settlers did not occur to any extent before 1827, in which year lead mines were opened; and a little later the agricultural possibilities of the territory began to be developed. A sharp conflict with the Indians, the "Black-Hawk War," tamed the truculent Sacs and Foxes; and the tide of immigration from the east set in. Racine and Sheboygan were founded in 1836, Kenosha in 1835, Oshkosh

AREA AND POPULATION OF MICHIGAN BY COUNTIES.

(ELEVENTH CENSUS: 1890.)

	Area in Square Miles.	Population.		Area in Square Miles.	Population.
Alcona	700	5,409	Lapeer	660	29,213
Alger	983	1,238	Leelanaw	350	7,944
Allegan	835	38,961	Lenawee	720	48,448
Alpena	580	15,581	Livingston	580	20,858
Antrim	538	10,413	Luce	915	2,455
Arenac	388	5,683	Mackinac	1,045	7,830
Baraga	915	3,036	Macomb	468	31,813
Barry	580	23,783	Manistee	550	24,230
Bay	466	56,412	Manitou	120	860
Benzie	340	5,237	Marquette	2,399	39,521
Berrien	570	41,285	Mason	500	16,385
Branch	504	26,791	Mecosta	580	19,697
Calhoun	720	43,501	Menominee	1,362	33,639
Cass	504	20,953	Midland	530	10,657
Charlevoix	427	9,686	Missaukee	580	5,048
Cheboygan	815	11,986	Monroe	530	32,337
Chippewa	1,606	12,019	Montcalm	720	32,637
Clare	580	7,558	Montmorency	580	1,487
Clinton	580	26,509	Muskegon	520	40,013
Crawford	580	2,962	Newaygo	860	20,476
Delta	718	15,330	Oakland	900	41,245
*Dickinson	....	....	Oceana	540	15,698
Eaton	580	32,094	Ogemaw	570	5,583
Emmet	438	8,756	Ontonagon	1,342	3,756
Genesee	640	39,430	Osceola	580	14,630
Gladwin	540	4,208	Oscoda	580	1,904
Gogebic	1,115	13,166	Otsego	540	4,272
Grand Traverse	485	13,355	Ottawa	570	35,358
Gratiot	560	28 668	Presque Isle	715	4,687
Hillsdale	597	30,660	Roscommon	580	2,033
Houghton	1,000	35,389	Saginaw	816	82,273
Huron	750	28,545	St. Clair	705	52,105
Ingham	552	37,666	St. Joseph	504	25,356
Ionia	580	32,801	Sanilac	960	32,589
Iosco	563	15,224	Schoolcraft	1,216	5,818
Iron	1,100	4,432	Shiawassee	528	30,952
Isabella	580	18,784	Tuscola	830	32,508
Isle Royal	215	135	Van Buren	630	30,541
Jackson	720	45,031	Washtenaw	720	42,210
Kalamazoo	576	39,273	Wayne	565	257,114
Kalkaska	580	5,160	Wexford	580	11,278
Kent	860	109,922			
Keweenaw	350	2,894	Total	57,430	2,093,889
Lake	580	6,505			

* Organized since 1890.

LAKE SUPERIOR
WISCONSIN
MICHIGAN
MINNESOTA
IOWA
ILLINOIS
APOSTLE IDS.
Superior
Duluth
Ashland
Chippewa Falls
Eau Claire
La Crosse
Wausau
Stevens Pt.
Oshkosh
Appleton
Neenah
Fond du Lac
Green Bay
Marinette
Portage
Watertown
MADISON
Janesville
Beloit
Dubuque
Prairie du Chien
Hancock
Iron Mtn.
Rhinelander
Merrill
Mississippi R.
Wisconsin R.
Longitude
ISLE ROYALE, MICHIGAN
Same Scale
DOMINION OF CANADA
LAKE SUPERIOR

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AREA AND POPULATION OF WISCONSIN BY COUNTIES.

(ELEVENTH CENSUS: 1890.)

	Area in Square Miles.	Population.		Area in Square Miles.	Population.
Adams	690	6,889	Marathon	1,584	30,369
Ashland	1,648	20,063	Marinette	1,118	20,304
Barron	900	15,416	Marquette	481	9,676
Bayfield	1,406	7,390	Milwaukee	232	236,101
Brown	530	39,164	Monroe	900	23,211
Buffalo	657	15,997	Oconto	1,127	15,009
Burnett	891	4,593	Oneida	2,036	5,010
Calumet	340	16,639	Outagamie	640	38,690
Chippewa	1,980	25,143	Ozaukee	232	14,943
Clark	1,224	17,708	Pepin	244	6,932
Columbia	780	28,350	Pierce	570	20,385
Crawford	535	15,987	Polk	955	12,968
Dane	1,200	59,578	Portage	792	24,798
Dodge	900	44,984	Price	1,160	5,258
Door	450	15,682	Racine	340	36,268
Douglas	1,336	13,468	Richland	570	19,121
Dunn	860	22,664	Rock	720	43,220
Eau Claire	648	30,673	St. Croix	730	23,139
Florence	498	2,004	Sauk	837	30,575
Fon du Lac	720	44,088	Sawyer	1,368	1,977
Forest	1,276	1,012	Shawano	1,152	19,236
Grant	1,130	36,651	Sheboygan	515	42,489
Green	576	22,732	Taylor	990	6,731
Green Lake	360	15,163	Trempealeau	732	18,920
Iowa	740	22,117	Vernon	800	25,111
*Iron	....	....	*Vilas	....	....
Jackson	992	15,797	Walworth	570	27,860
Jefferson	570	33,530	Washburn	864	2,926
Juneau	800	17,121	Washington	430	22,751
Kenosha	280	15,581	Waukesha	576	33,270
Kewaunee	336	16,153	Waupaca	756	26,794
La Crosse	450	38,801	Waushara	645	13,507
Lafayette	630	2 ,265	Winnebago	460	50,097
Langlade	876	9,465	Wood	828	18,127
Lincoln	700	12,008			
Manitowoc	587	37,831	Total	54,450	1,686,880

* Organized since 1890.

and Janesville in 1836; Milwaukee in 1835; Madison in 1836; La Crosse in 1840; Stevens Point in 1843; and Appleton in 1848. In 1846, a convention drew up a state constitution, which was rejected by the people because of its financial provisions. A second constitution was prepared in 1847, and ratified; and the state was admitted to the Union, May 29, 1848. The territorial capital had been first at Belmont, but Madison was selected in 1838, and was adopted as the seat of the state government. During the civil war, Wisconsin furnished 91,327 soldiers to the Union armies.

Geology and Mineralogy.—The geology of the state is the series of rocks extending from the Laurentian to the Devonian period. In the north-central portion there is a large area of archæan rocks, having an extreme length east and west of nearly 240 miles, and a breadth north and south of 160 miles. These rocks are metaphoric in origin, and consist chiefly of granite, gneiss, syenite, diorite, and other hornblendic and allied rocks, quartzite, porphyrite, and a variety of schists and slates. South, south-west, and south-east of this tract, and again on the Lake Superior slope, appears the Silurian period, which prevails over all the rest of the state, several beds of the upper and lower Silurian having been identified as belonging to the well-known New York series of paleozoic groups. In the south-west, the Galena limestone prevails, and in the north are handsome Laurentian limestones or marbles, blue, red, dove-colored, and variegated. All these rocks are older than those of the coal formations, and consequently no coal is found in the state. Lead ore is the most important mineral product, and this is obtained chiefly in Grant, Lafayette, and Iowa counties. Iron ores are found in large quantities at Iron Ridge in Dodge county, at Ironton in Sauk county, at the Black River falls in Jackson county, and in the Penokee iron range in Ashland county, near Lake Superior. Magnetic ores also occur in the archæan region in the vicinity of the Menominee river, in the north-eastern part of the state. Native copper is found in limited quantities in the northern part of the state, and copper ores have been discovered in fissures in Iowa and Crawford counties. Two ores of zinc, associated with the lead, have been smelted at Mineral Point. Limestone, glass-sand, porcelain clay (at Grand Rapids), hydraulic cement, fine brick clays (notably those of Milwaukee), gypsum, plumbago, and peat are found, and traces of silver have been reported.

Zoölogy.—This embraces 62 species of mammals, over 300 birds, 19 species of reptiles, and over 100 mollusks. The elk is occasionally found; and deer, bears, beavers, the fisher, wolf, otter, wildcat, and porcupine are not uncommon; while the rabbit, squirrel, striped gopher, mole, bat, and field-mouse exist in great numbers. The larger birds are the golden and bald eagles, great white owl, quail, partridge; the spruce, willow, prairie, and sharp-tailed grouse, woodcock, wild goose, duck, pelican, and loon. The lakes and rivers abound with fish, especially the whitefish, lake trout, siskewit, muscalonge, perch, pickerel, and sturgeon.

Botany.—Much of the northern portion is covered with forests that furnish many millions of feet of lumber annually. The prevailing trees in this region are the lofty white pine, balsam, hemlock, and other cone-bearing evergreen trees. There are 80,000 acres of white pine along the Wisconsin river and its tributaries. The southern half of the state is partly prairie, though here and there are islands of timber, or, as they are sometimes called, "oak-openings," the trees being mainly the burr oak. The hickory, birch, elm, sycamore, and sugar-maple are widely distributed.

Climate.—The climate of the state is considered, notwithstanding the long and severe winters, healthful. The mean annual temperature of the southern and more settled portion is 41.5°; mean temperature in winter, 20°; in spring and autumn, 47°; and in summer, 70°. At Green bay, the mean annual temperature is 43.65°. Snow usually falls in the north before the occurrence of heavy frost, and continues to cover the ground until spring, protecting the roots of plants from freezing, and hastening the growth of vegetation in the spring. The annual quantity of rain and melted snow is about 30 inches; and the barometer varies in its extremes from 28 to a little above 30 inches, the mean being about 29.5 inches. The Milwaukee river, as a rule, is closed for about 100 days in the year.

Soil and Agriculture.—The soil in the north is broken, with drift and boulders, covered with heavy pine forests, abounding in marshes, and not well adapted to cultivation; the middle and southern region, of prairies and park-like oak openings, is exceedingly rich and productive, raising great quantities of wheat, Indian corn, oats, barley, potatoes, tobacco, etc. Much of the soil is sandy, but naturally productive. In agricultural products the state ranks among the first in the Union. Its annual yield of crops is valued at $60,000,000, and includes 65,000,000 bushels of oats, 39,000,000 bushels of corn, 9,000,000 bushels of wheat, 9,000,000 bushels of barley, 13,000,000 bushels of potatoes, 2,000,000 tons of hay, and 15,000,000 pounds of tobacco. Rye is also largely grown; and apples and cranberries form an important staple. In the production of hops, Wisconsin is surpassed by New York alone. Wild rice grows along the lakes; and flax is largely marketed at Kenosha. The value of the live stock in Wisconsin is given in round numbers as $60,000,000. There are some 633,000 cattle, 421,000 horses, 600,000 sheep, and 2,250,000 swine. The dairy-products are estimated at $15,000,000 annually. The great center for this traffic is Sheboygan.

Manufactures, etc.—In manufactures the state has made excellent progress, and a large number of busy manufacturing towns have come into active existence here and

there. The U. S. census of 1890 reported for Wisconsin, 10,417 manufacturing establishments, employing $246,515,404 capital and 132,031 persons, paying $51,843,708 for wages and $145,437,016 for materials, and having a combined output valued at $248,546,164. The principal manufactures are lumber and mill products from bolts or logs, flour and grist mill products, malt liquors, tanned and curried leather, packed meat, timber products not manufactured at mills, foundry and machine shop products, dairy products, iron and steel, planing-mill products, agricultural implements, paper, furniture, boots and shoes, cigars and cigarettes, and malt. The breweries of Milwaukee are famous all over the world. At Milwaukee are also extensive stove works. At Superior is found the largest system of connected grain-elevators in the world, having a capacity of 50,000,000 bushels. At Racine is the largest establishment for the manufacture of threshing-machines.

Wisconsin is one of the principal iron-producing states, and had (1895) an output of ore, mostly red hematite, aggregating about 650,000 long tons, valued at over $600,000. The production of pig iron was 148,400 long tons; of rolled iron and steel, 85,006 long tons. A great charcoal furnace is situated at Ashland on Chequamegon bay, which place is the main shipping port for the Gogebic iron range opened up in 1885. Along the shores of Lake Michigan are rich deposits of clay, from which common, pressed, fancy, and firebrick are annually made to the value of nearly $1,000,000, used largely in Milwaukee, and from their color giving to that city the title of "The Cream City." Great quantities of quicklime are produced at Pewaukee, Racine, and Watertown; while the central counties yield quartz-porphyry; Waukesha and Prairie du Chien, limestone; and Milwaukee, cement rock.

Banking and Financial.—On Oct. 31, 1896, there were 81 national banks in operation, with combined capital $10,730,000, deposits $35,464,603, reserve $11,190,532, and outstanding circulation $3,199,646, and 126 state banks, with capital $6,827,750, deposits $26,573,706, and resources $36,715,309. There were also 107 private banking houses, four loan and trust companies, and a mutual savings bank.

The state finances are in a very favorable condition. The total indebtedness is to state trust funds, which in 1897 were, school fund $1,563,700, normal school fund $515,700, university fund $111,000, and agricultural college fund $60,600—in all $2,251,000. The assessed property valuations are, real estate $482,799,128, personal property $120,674,398,—total $603,473,526, tax rate $2.27 per $1000, amount of taxes raised, over $1,370,000.

Commerce.—The foreign commerce of the state is not very extensive comparatively, Milwaukee being the chief port of entry; but the coastwise and river commerce is large, and is conducted for the lakes from Milwaukee, Sheboygan, Fond du Lac, and Superior, and for the Mississippi river from La Crosse and Prairie du Chien, while steamers also ascend the Wisconsin, Chippewa, Fox, and other rivers. There is a flourishing coastwise trade.

Railroads.—The first railway in Wisconsin was begun in 1850, and consisted of a track between Milwaukee and Elm Grove, laid by the Milwaukee and Mississippi R. R., and extended to Janesville in 1852. In 1897, there were over 7500 miles of line in the state, the chief roads being the Chicago, Milwaukee, and St. Paul; the Wisconsin Central; Chicago, St. Paul, Minneapolis, and Omaha; Northern Pacific; St. Paul and Duluth; Chicago and Northwestern; Duluth, South Shore, and Atlantic; Green Bay, Winona, and St. Paul; the Minneapolis, St. Paul, and Sault Ste. Marie; and the Burlington route.

Education.—Wisconsin spends nearly $7,000,000 every year upon its fine school system, which is richly provided for by grants of land both Federal and State. Compulsory attendance for 12 weeks each year is required from children between the ages of seven and twelve. There are state normal schools at Platteville, Whitewater, River Falls, Oshkosh, Milwaukee, and Stevens Point; and private normal schools at Milwaukee and St. Francis. The State University of Wisconsin is beautifully situated in a magnifi cent park overlooking Lake Mendota, northwest of the State Capitol at Madison. It has courses in letters, science, engineering, law, and pharmacy. Here is the Washburn observatory, erected in 1880 at a cost of $50,000; and attached to the university is also the state experimental station. Other institutions for the higher learning are Beloit College, founded in 1847, famous for the number of clergymen among its graduates; Racine (Episcopal) College at Racine, with its fine quadrangle of Gothic buildings and handsome grounds; Lawrence University, founded in 1847 by Amos Lawrence of Boston, at Appleton; Ripon College, founded in 1854; Milton College; Gale College, Galesville; Northwestern University at Watertown; Carroll College (Pres.), at Waukesha; Marquette College (R. C.), at Milwaukee; Downer College (Cong. and Pres.), at Fox Lake; and Milwaukee College (non-sect.), Milwaukee (the two last for women only). The Protestant Episcopal Seminary at Nashotah was founded in 1841 and has trained many missionaries. The Lutherans have a seminary at Milwaukee; the Reformed Church Mission is at Franklin; and the Roman Catholic Seminary of St. Francis de Sales at St. Francis. The Wisconsin Sunday-School Assembly owns a park of 30 acres on Monona Lake, with a tabernacle and other buildings, and is a branch of the Chautauqua (q.v.) enterprise. There are many fine public libraries in the state apart from those connected with the schools and colleges. Especially fine are those at Milwaukee and La Crosse, and of the State Historical Society at Madison.

The first newspaper in Wisconsin was established at Green Bay in 1833, *The Green Bay Intelligencer*. There are now upwards of 600, of which over 100 are in German.

RELIGIOUS.— The Protestant Episcopal church has the dioceses of Fond du Lac and Milwaukee, and the Roman Catholic church, the archdiocese of Milwaukee and the dioceses of Green Bay and La Crosse. The leading denominations numerically are the Roman Catholic, Lutheran, Methodist, Episcopal, Congregational, Baptist, Evangelical Association, German Evangelical synod, and Presbyterian. All communicants aggregate over 550,000; church edifices, 3200; halls used for church purposes, 480; and value of church property, $14,500,000.

GOVERNMENT.—The capital is Madison, where there is a handsome capitol and other public buildings. The constitution of the state grants the right to suffrage, with the usual exceptions, to every male citizen 21 years of age, and also to all persons who have declared their intention to become citizens, and who have resided in the state one year. State elections are held biennially in November; for judges and town and village officers in April. The executive power is vested in a governor, lieutenant-governor, secretary of state, attorney-general, etc. The legislature consists of a senate, with 33 members, elected for four years, and an assembly of 100 members, elected for two years. Each member receives $500 for each regular session. The legislature meets on the first Monday in January, and the sessions are not limited in duration. The governor receives a salary of $5000 per annum. The supreme court of the state consists of five justices, and there are 14 district courts, besides those of counties, cities, and towns. United States district courts sit at Madison and Milwaukee.

The state militia has an authorized strength of 3104 officers and men, and an actual strength of 2661, the force liable to military duty exceeds 372,000 men. The State Veterans' home is at Waupaca. The state prison is at Waupun; the industrial school for boys at Waukesha; and that for girls at Milwaukee. At Janesville is the institution for the blind; at Delavan, the institution for the deaf and dumb. At Madison and Oshkosh are the state hospitals for the insane. Near Milwaukee in a great park of 400 acres is the northwestern branch of the national home for disabled volunteer soldiers with a handsome chapel, a library, reading-room, etc.

The electoral vote of Wisconsin has been cast as follows: in 1848, for Cass and Butler; in 1852, Pierce and King; in 1856, Fremont and Dayton; in 1860, Lincoln and Hamlin; in 1864, Lincoln and Johnson; in 1868, Grant and Colfax; in 1872, Grant and Wilson; in 1876, Hayes and Wheeler: in 1880, Garfield and Arthur; in 1884, Blaine and Logan; in 1888, Harrison and Morton; in 1892, Cleveland and Stevenson; in 1896, McKinley and Hobart, 12.

POPULATION. — In 1840, the population of Wisconsin was 30,945; in 1850, 305,391; in 1860, 775,881; in 1870, 1,054,670; in 1880, 1,315,497; in 1890, 1,686,880. In 1890, there were 8896 Indians within the limits of the state and included in the census figures. From 1880 to 1890, the population of Wisconsin increased 27.99 per cent. It stands fourteenth in order of population among the states of the Union.

There are (1897) 70 cos., for whose population see the Census Tables in the Appendix to Volume XV. In 1890 there were 34 incorporated cities in the state, of which 26 had more than 5000 inhabitants, and 12 more than 10,000 inhabitants. These last are Milwaukee , 204,468; La Crosse, 25,000; Oshkosh, 22,836; Racine, 21,014; Eau Claire, 17,415; Sheboygan, 16,359; Madison, 13,426; Fond du Lac, 12,024; Superior, 11,983; Appleton, 11,869; Marinette, 11,523; and Janesville, 10,836.

WISCONSIN, UNIVERSITY OF, at Madison, the capital of the state; organized in 1849; reorganized, 1866. It is a state institution, unconnected with any religious denomination, and open upon equal terms to students of both sexes. Its object is to provide the means of acquiring a thorough knowledge of the various branches of learning connected with scientific, industrial, and professional pursuits. It consists of (1) the college of letters and science, including the school of economics, political science and history, and the Washburn observatory; (2) college of mechanics and engineering; (3) college of agriculture; (4) college of law; (5) school of pharmacy; (6) university extension department; (7) school of music; and the (8) summer school. The college of letters and science includes a wide range of subjects. The college of mechanics and engineering embraces graduate and undergraduate courses in civil engineering, mechanical engineering, electrical engineering, and railway engineering. The college of agriculture includes various instructional courses in general agriculture and dairying, and the agricultural experiment station. The university has funds amounting to over $500,000, chiefly derived from the proceeds of U. S. government land grants, and has an annual income of over $350,000. Its buildings number eighteen, and are valued with contents at $1,119,000. The grounds comprise 300 acres, valued at about $200,000. The library contains about 50,000 volumes. The university is provided with extensive and valuable mineralogical and geological cabinets and collections in natural history. It has 40 laboratories in all departments of science. There is a gymnasium for men and one for women, an athletic field, a boathouse, and a rowing tank. Professors and other instructors, 1896–97, 112; over 1600 students. Charles K. Adams, LL.D., president.

WISDOM, BOOK OF, found in the Apocrypha under the title *Wisdom of Solomon*, contains three parts: The *first*, commending wisdom; the *second*, teaching how wisdom may be gained; and the *third*, illustrating wisdom and folly. See APOCRYPHA.

WISDOM TEETH. See TEETH.

WISE, a co. in n. Texas, drained by the West fork and Denton fork of the Trinity river; 900 sq.m.; pop. '90, 24,134, with colored. Co. seat, Decatur.

WISE, a co. in s.w. Virginia, having the Cumberland mountains on the n.w. separating it from Kentucky, bounded on the s.e. by Clinch river, drained by Russell's fork of Sandy river; 385 sq.m.; pop. '90, 9345. Co. seat, Wise.

WISE, Henry Alexander, American statesman, was b. at Drummondtown, Accomac co., Va., Dec. 3, 1806; graduated at Washington college, Pennsylvania, in 1825; studied law at Winchester; settled and married at Nashville, Tenn., but two years after returned to his native county, and engaged in politics; in 1825, advocated the nomination of Gen. Jackson at the Baltimore convention; opposed nullification, but maintained the state-rights doctrines of Jefferson and Madison as expressed in the Virginia resolutions of 1798, that "each state for itself is the judge of the infraction of the constitution, and of the mode and manner of redress." Elected to congress in 1833, he was involved in a duel with his opponent, whose arm he fractured. On the removal of the government deposits by Gen. Jackson, he went over to the opposition or whig party, but was sustained by his constituents, over whom he had an unbounded personal influence. In 1837 he was the second of Mr. Graves, a member of congress from Kentucky, who shot Mr. Cilley, a member from Maine, in a duel. In 1840 he secured the nomination of John Tyler as vice president; and on Tyler becoming president by the death of Gen. Harrison, had a powerful influence in his administration. Nominated minister to France, he was rejected by the senate, but confirmed for Brazil, where he resided until 1847. He was now once more identified with the democratic party; and in 1854, after an arduous electioneering campaign, in which, though in feeble health, he traveled 3,000 m., and made 50 stump speeches against the "know-nothing" or Protestant native American party, he was elected governor of Virginia. In 1859 he published a treatise on territorial government, maintaining the right of congress over the institution of slavery. In December of this year, he signed the death-warrant of John Brown, hanged for treason in attempting to excite a negro insurrection. In 1861 as member of the Virginia convention, he labored for conciliation; but when his state voted for secession, he entered heartily into the war, and was appointed brig.gen. He died in 1876.

WISEMAN, Nicholas, cardinal, and Roman Catholic archbishop of Westminster, was b. Aug. 2, 1802, at Seville, of an Irish family. He was brought to Ireland in his childhood, and received his first education at Waterford, whence he was removed to the Roman Catholic college of St. Cuthbert at Ushaw, near Durham. In his 16th year, he entered as an ecclesiastical student the English college at Rome, and after a very brilliant course, received holy orders at Rome in 1823, at which time he was also admitted to the degree of doctor of divinity, and was appointed vice-rector of the English college, and professor of oriental languages in the university of the Sapienza. In 1828 he published his *Horæ Syriacæ*, and in the end of that year was named rector of the English college. It was while he held this office that he delivered his *Lectures on the Connection of Science and Revealed Religion* (2 vols. 8 vo, 1836). But in England he first became known by a series of lectures on *The Doctrines of the Catholic Church*, delivered at Moorfields church, and published in two vols. in 1836. In the same year he established, in concert with Mr. O'Connell, the *Dublin Review*, a journal which has since continued to be the quarterly organ of the Roman Catholic body, and to which Dr. Wiseman, even while residing abroad, was a regular contributor. In 1840 he was named coadjutor vicar-apostolic of the central district of England, with the title of bishop of Melipotamus *in partibus infidelium* (q.v.). At the same time he was appointed president of St. Mary's college of Oscott, where he took up his residence. The circumstances of religious parties in England at this period contributed much to bring Dr. Wiseman's very remarkable abilities as a polemical writer into prominence; and the dissensions which arose in the church of England during the Tractarian controversy, were turned to effect by him in various lectures, pamphlets, reviews, essays, etc. In 1846 he was transferred as coadjutor vicar-apostolic to the London district; and in 1849 became himself acting vicar. In the following year, he came still more remarkably into notice, during the progress of a change in the position of the Roman church in England, which, for a time, was the occasion of almost unexampled religious excitement in the country. From the reign of Elizabeth, the sees in England having been occupied by bishops of the established church, and it being penal for a bishop or priest of the Roman Catholic church to officiate in England, the Catholics, for the necessary religious ministrations of their church, had resorted to the well-known expedient of a system of bishops *in partibus infidelium* (q.v.), with the title and authority of vicars apostolic. This form of church government, with some modification, had in substance subsisted from the time of James I.; but from the date of the passing of the Catholic emancipation act, a desire had gradually sprung up among Catholics for the restoration of the normal form of church government by the appointment of regular bishops. This measure was finally determined on by the pope in the year 1850, and a new distribution of the kingdom was made into 12 sees (one of them archiepiscopal), in which, in order that it might not be supposed to clash with the existing episcopal system, the names of the ancient sees were carefully avoided, the titles of the new bishops being taken exclusively from cities and towns which were non-episcopal. Dr. Wiseman was named archbishop of the see of

Westminster, which included great part of the district already under his charge, and was at the same time created cardinal. This measure, for which the Protestant public were but little prepared, and which was made more formidable in their eyes by the language which was employed, although but following the established canonical forms, and bearing altogether on the spiritual concerns of the Catholics, was supposed to involve an invasion of the rights and dignities of the established church and of the crown, and called forth a storm of religious excitement which was unexampled during the memory of the living generation. While this excitement, which was much influenced by a letter addressed by the prime minister to the bishop of Durham, was at its height, the new cardinal, who had gone to Rome to receive the cardinal's hat, returned to England, and published an explanatory address of great ability and moderation, but yet firmly asserting the strictly constitutional rights of his fellow-Catholics, entitled *An Appeal to the Reason and Good Feeling of the people of England on the Subject of the Catholic Hierachy.* This address, as well as certain lectures subsequently delivered by him, and extensively circulated, did much to mitigate the excitement, which nevertheless led to violent debates in parliament, and to the passing of an act prohibiting the use of ecclesiastical titles other than those recognized by the law. See Ecclesiastical Titles Assumption Act. Notwithstanding these unfavorable circumstances of his introduction into notice in England, however, the undoubted abilities and great literary eminence of cardinal Wiseman eventually compelled the admiration of the British public. He took frequent occasion, moreover, by public lectures and addresses on the neutral subjects of education, literature, and art, to identify himself with the spirit of progress, and with the national sentiments of his fellow-countrymen; and notwithstanding the infirmity of his constitution, which began to fail soon after his return to England as cardinal, he published during these years a succession of works which although with the strong religious bias natural to a Roman Catholic churchman of earnest convictions, possessed much, nevertheless, congenial to the sympathies of cultivated Englishmen of every degree. The *Lectures on Religion and Science* already referred to; *On the Connection between the Arts of Design and those of Production;* on the *Influence of Words on Thought and Civilization;* on the *Points of Contact between Science and Art; Recollections of the Last Four Popes,* and other similar works, obtained an extensive circulation; and partly from their effect upon the public mind, partly, no doubt, from the reaction consequent on what was soon felt to have been a groundless and exaggerated alarm, cardinal Wiseman came by degrees to command the respect of the public at large. He died in his 63d year, on Feb. 15, 1865; and his funeral, which was conducted with great solemnity, and excited great public curiosity and interest, was witnessed with every demonstration of respect by one of the largest assemblies seen for many years in London. Besides admittedly high professional learning, he was a scholar of rare and singularly various attainments, an eminent linguist, a well-informed scientific scholar, a distinguished orator, a graceful and vigorous writer, and an accomplished critic and connoisseur of art. In addition to the works incidentally mentioned above, he published *The Real Presence of the Body and Blood of Our Lord Jesus Christ in the Eucharist* (8vo, 1836); *Reply to Dr. Turton on the Eucharist* (8vo, 1839); *Lectures on the Ceremonies of Holy Week* (8vo, 1839); *Essays on Various Subjects* (3 vols., 8vo, 1853)—a selection of articles contributed to the *Dublin Review* and other periodicals, and of other fugitive essays; *Fabiola, or a Church of the Catacombs;* a singularly truthful and life-like picture of early Christian life in classic Rome; *Sermons* (2 vol., 8vo, 1864); with many shorter publications. He also left a large collection of MSS., many of them prepared for the press. In 1866 appeared *The Witch of Rosenburg, a Drama in Three Acts;* and *Daily Meditations* in 1868.

WISHART, George, one of the early reformers of Scotland, is supposed to have been a native of Forfarshire, a son of James Wishart of Pittarrow, justice clerk in the reign of James V. The exact date of his birth is unknown. He first emerges into notice in the beginning of the 16th century. At this time he taught a grammar school at Montrose, and made himself remarkable by introducing the study of Greek. He began also to preach the doctrines of the reformation, and was obliged to flee into England. Here he is found at Bristol about 1538, preaching the same doctrines, but being seized upon and threatened with death, he publicly recanted. Later he is found at Cambridge, in the center of the Anglican reform movement, which had begun there under the influence of Bilney and Latimer. He is described at this time by a pupil of the name of Tylney as a "tall man polde-headed, of melancholy complexion, black-haired, long-bearded, comely of personage, well spoken after his country of Scotland, courteous, lowly, lovely, glad to teach, desirous to learn, abstinent in his habits, and very charitable to the poor." His portrait, which has been preserved in the university of Glasgow, answers to the personal characteristics here mentioned. He returned to Scotland in 1543 or 1544, with the commissioners sent to negotiate a treaty with Henry VIII., and it was then that he entered upon his special reforming mission, terminating in his martyrdom. He appears to have possessed great powers as a preacher, although it is doubtful whether he ever took orders; and he traveled from town to town, and county to county, making everywhere a great impression by his stirring words. Knox has given in his *History*, book i., a very striking description of the effects of Wishart's preaching. Its effect upon himself was the most

important and fruitful of all. When the preacher came to Lothian, Knox, charmed by his character and teaching, attached himself to his person, bearing a "two-handed sword" before him. This precautionary defense was rendered necessary by two attempts supposed to have been instigated by Beaton against his life. His activity and influence were too prominent long to escape notice. Cardinal Beaton had had his eye upon him for some time, and while he rested at Ormiston, after preaching a powerful sermon at Haddington, he was made a prisoner by the earl of Bothwell. Beaton himself was in the neighborhood with a considerable force, in case it should have been attempted to rescue him. He was conveyed to St. Andrews, and immediately put upon his trial before an ecclesiastical tribunal. Arran, the governor, refused to give his countenance to the proceedings; but the reforming preacher was nevertheless condemned to be burned at the stake; and the sentence was carried out before the castle or episcopal residence at St. Andrews on Mar. 12, 1546.

Wishart is reported to have given utterance at the stake to a prophecy of the death of the cardinal, which took place about three months after his martyrdom. "But he who from yonder high place beholdeth us with such pride shall, within a few days, be in the same as ignominiously as now he is seen proudly to rest himself," are the words attributed to him. This has appeared to some recent writers to strengthen the suspicion, otherwise suggested, of Wishart having been accessory to the plot for assassinating the cardinal. The main ground of this suspicion is the discovery of a document in the state paper office, bearing that "a Scotishman called Wysshart," a friend of the laird of Brunstone, was concerned in this plot. Mr. Tytler confidently adopted the view that this friend of the laird of Brunstone and the reformer were the same person, and it cannot be denied that there are reasons in favor of this inference, not in the mere coincidence of the name, perhaps, but in the fact of the association of the person bearing it with the laird of Brunstone, who was a familiar friend of Wishart; and further, in the fact, that Kirkaldy of Grange and the master of Rothes, who are mentioned in the document as conspiring either to "apprehend or slay the cardinal," were afterward really his murderers. At the same time, it cannot be said that there is decisive evidence to prove that the "Wysshart" of the state document was George Wishart, the reformer and the martyr. The coincidences might be accidental, and the question will probably remain among the *questiones vexatæ* of Scottish history.

WISHAW, a thriving t. of Scotland, in Lanarkshire, 13 m. e.s.e. of Glasgow, and near the South Calder water. It was made a police burgh in 1855. There are a number of collieries, blast furnaces, iron and steel works, etc. Pop. '91, 14,869.

WISMAR, seaport of Mecklenburg-Schwerin, at the head of a bay of the same name, an inlet of the Baltic. Its harbor is the best on the Baltic coasts, and is furnished with ship-building docks. Its old fortifications have been removed; but many of its old buildings, which are exceedingly curious and picturesque, remain. Commerce, ship-building, the fisheries, tobacco, playing-cards, sail-cloth manufactures, and agriculture are the principal employments of the inhabitants; there are also breweries and distilleries. Wismar is the terminus of a branch of the Mecklenburg railway, and communication by steamers subsists between it and Copenhagen. Pop. '90, 16,787.

WISNER, Benjamin Blydenburg, d.d., 1794–1835; b N.Y.; graduated with honors at Union college, 1813; had charge of Johnstown academy, 1813–14; tutor at Union college, 1815–18, during which time studied theology; graduated at Princeton seminary, 1820; pastor of old South church, Boston, 1821–32; one of the secretaries of the A. B. C. F. M., 1832–35, and as such was highly efficient and successful, visiting many Congregational and Presbyterian churches, forming missionary associations and awakening great zeal for the cause. He was also an active member of several other benevolent societies, and was author of a history of the old South church.

WISSEMBOURG (German *Weissenburg*), till 1871 a French fortified t., now capital of a district in the German province of Lower Alsace, is on the Lauter, 32 m. n.n.e. of Strasburg. It has a flourishing trade, and a pop. of (1890) 5846. Here was fought, Aug. 4, 1870, the first great battle of the Franco-German war. Besides the fortifications of Wissembourg, demolished in 1872, the lines of Wissembourg are famous—a line of works extending to Lauterburg, 9 m. south-east.

WISTAR, Annis Lee (Furness), b. Philadelphia, 1830; daughter of the Rev. Dr. W. H. Furness, and wife of Dr. Caspar Wistar. She has published several translations from the German of Marlitt, Wilhelmine von Hillern, Huckländer, and others.

WISTAR, Caspar, 1761–1818; b. Philadelphia; received a medical degree from the university of Edinburgh in 1786. He was professor of chemistry and physiology in the Philadelphia medical school, 1789–92, when he was appointed adjunct professor of anatomy and surgery. In 1808 he became full professor in those departments, and held that position till his death. He published, among other works, *A System of Anatomy*.

WISTA'RIA, a genus of plants of the natural order *leguminosæ*, sub-order *papilionaceæ*, having pinnate leaves and flowers in terminal racemes, the pod leathery. The species were formerly included in the genus *glycine*. Some of them are among the most magnificent ornamental climbers known in flower gardens. *W. frutescens*, a

native of Virginia, Illinois, and other parts of North America of similar climate, found chiefly in marshy grounds, attains the length of 30 ft., and has beautiful racemes of fragrant bluish purple flowers. *W. Chinensis* or *consequana*, a native of China, has larger flowers in pendulous racemes, and its branches run to the length even of 90 feet. In Britain these plants are generally trained on walls.

WITCH-CRAFT * is merely the form that the belief in the arts of magic assumed under the action of certain notions introduced by Christianity. The powers supposed to be possessed by the witches, and the rites and incantations by which they acquired those powers, were substantially the same as belonged to the devotees of the Greek Hecate (q.v.), the Striga and Venefica of the ancient Romans, and the Vala or wise woman of the Teutonic pagans. But when, along with the knowledge of the one true God, the idea of a purely wicked spirit, the enemy of God and man, was introduced, it was natural that all supernatural powers not proceeding directly from the true God, should be ascribed to him. This gave an entirely new aspect to such arts: they became associated with heresy; those who practiced them must be in compact with the devil, and have renounced God and the true faith. Previously, if a witch was punished, it was because she had been guilty of poisoning, or at least was believed to have poisoned or wrought some other actual mischief. Now, however, such power was only the power to work evil; and merely to be a witch was in itself a sin and crime that filled the pious mind with horror. This feeling, zealously fostered, first by the Catholic clergy, and then no less by the Protestant, rose to a frenzy that for four centuries filled Europe with the most shocking bloodshed and cruelty.

Almost all the various notions and practices noticed under the heads MAGIC, DIVINATION, INCANTATION, AUGURIES, CHARM, TALISMAN, ORDEAL, FETICHISM, EVIL EYE, etc., are embodied more or less prominently in the huge mass of superstitions which formed the creed of witchcraft in its full development. A reference, therefore, to those heads, and to the kindred subjects of ASTROLOGY and ALCHEMY, saves the necessity of entering into descriptive details of what witchcraft was. What was new and distinctive in the witchcraft of Christendom was the *theory* of magical arts which it involved. The doctrine of the devil (q.v.), as finally elaborated in the middle ages, established in the world a rival dominion to that of the Almighty. The arch-fiend and his legions of subordinate demons (q.v.) exercised a sway, merely permitted, no doubt, but still vast and indefinite, not only over the elements of nature, but over the minds and bodies of men—all except those who had been admitted by baptism into the number of the "redeemed" (see ATONEMENT), and continued to be guarded by the faith and rites of the church. The faithful could not be led into evil against their will, nor essentially injured in person; but not even they were altogether exempt from diabolic annoyance, for the immunity does not seem to have extended to their belongings. As a strictly logical consequence of this assumed constitution of things, it followed, that those mortals who had the gifts of producing supernatural effects of any kind (and that such gifts had been possessed by individuals in all ages and countries, was not for a moment questioned), must derive their power from the prince of darkness and be acting as his agents—always excepting, of course, those miraculous powers which the church herself claimed to exercise in the name of heaven. Moreover, as the universally coveted powers of fortune-telling, and of controlling the elements for your own benefit or the hurt of your enemies, could not be supposed to be bestowed by a being of the devil's character except as a *quid pro quo*, and as the object dearest to the devil's heart—the very aim and end, in fact, of his struggle with the kingdom of light—was to win back as many as possible of the souls that had been redeemed from his dominion by the death of Christ, it was natural to conclude that the price he would demand for his gifts would be a renuncia-

* Not a little light is thrown on the original conception of witchcraft, and the magic arts in general, by observing the primary meaning of the various terms employed in connection with them. The most striking thing is the number of those terms that come from roots signifying simply *to do, perform*. From this notion the transition is easy to a variety of shades of meaning, as is seen in Lat. *facinus*, which radically signifies a deed (from *facere*, to do), but became restricted to a *bad* deed, a crime. The Greek ερδειν or εργειν (= Eng. work), and the Lat. *facere*, *operari*, were used, without any addition, to signify to perform sacrifice or other sacred or magical rite. Accordingly, in Low Lat., *factura* signified sorcery; and in modern Ital. *fattura* = incantation, and *fattucchiera* = a sorceress or witch. Lat. *factum* becomes in Span. *hecho*, and means a crime; while *hechicero* is a sorcerer, and *hechiera*, a witch. The Portuguese *feitiçao*, magic, is also from Lat. *factum;* and Sans. *kratu*, a sacrifice, is from *kri* (= Lat. *creare*), to make.

The Eng. *witch* is *vicce* in Ang.-Sax., which has also *viccian*, to fascinate, and *viccancräft*, the art of magic; the Low Ger. dialects have similar forms (e.g., Dutch *wikkerij* = witchcraft); in High Ger. there are no cognate names. These words, as is seen in the Dutch form, have clearly no connection with *witan* (Ger. *wissen*), to know, which is usually given as the root of the English witch; and the most probable etymology is that proposed by J. Grimm, who derives them from the Gothic *veihan* (O. H. Ger. *wihan*, modern Ger. *weihen*), which signified to consecrate, but which he infers to have meant primarily to do, make, perform (see *Deutsche Myth.*, pp. 36, 58, 408; *Deutsche Gramm.* iii. 181). *Wiht*, or *wicht*, is evidently a derivative from this root, and signified a thing made (Lat. *factum*), a creature, a person, and, in some Teutonic dialects, a demon. A *vicca* was thus a *doer* of sacred or magic rites (compare the "I'll do, I'll do, I'll do!" of Shakespeare's witches). *Wicked* is a participle from the same root, and signified primarily bewitched, accursed, hence perverse. *Wizard* is probably a masculine form of *vicca*.

Nearly corresponding to English witch were the Lat. terms *saga*, a knowing or wise woman; *strix*, *striga*, a kind of nocturnal bird, hence a witch; *venefica*, literally, a poison-maker, a concocter of drugs. The Ger. *hexe*, old Dutch *hagetisse*, Ang.-Sax. *hägtesse*, or *hägesse* (from which Eng. *hag*), appear to come from *hag*, cognate with Lat. *sagus*. In O. Norse *hagr* signifies dexterous, cunning.

tion of Christianity and entrance into his service. Hence it came to be the established belief, that in order to acquire the powers of witchcraft, the person must formally sell his or her soul to the devil. The idea of a covenant with the arch-enemy was not involved in the early and heathen conception of magic. Originally magic was identical with the lowest form of religion, that is, Fetichism (q.v.). It was grounded on the idea that certain natural objects and certain rites and observances had, in themselves, a mysterious power of producing wonderful effects; and the art of the magician consisted in the knowledge of these mysterious powers, and in the skill to combine and direct them to special purposes. The effects were not conceived as being produced by the interference of any conscious being—god or devil. On the contrary, a human being could, through magical means, acquire control over supernatural beings. The Hindus carry this notion so far, that they represent some of their sages as practicing austerities and performing sacrifices and other rites, until they can control the gods themselves, and even threaten their destruction along with that of the universe (see VISWÂMITRA). The higher kind of European magic in the middle ages, was mixed up with what physical science there then was; and the most noted men of the time were addicted to the pursuit, or were at least reputed to be so. So far from deriving their power from the kingdom of darkness, the scientific magician, by the mere force of his art, could compel the occasional services of the arch-fiend himself, and make inferior demons the involuntary slaves of his will. A belief, however, had early existed that individuals in desperate circumstances had been tempted to purchase, at the price of their souls, the help of the devil to extricate them from their difficulties (see THEOPHILUS); and hence a suspicion began to grow that many magicians, instead of seeking to acquire their power by the laborious studies of the regular art, had acquired it in this illegitimate way. At last, as the system of dualism above mentioned became more perfect, the art of magic was wholly diabolized, and a compact with the evil one was thought to be the sole charter of supernatural power. See FAUST. This transformation took place earlier and more completely (about the 13th c.) in regard to those lower forms of the magical art which constitute witchcraft proper, and which have from ancient times been considered the special province of women. The chief cause of the prominent part assigned to the female sex in this matter is noticed in the article MAGIC. In addition, it may be observed, that their more excitable temperament renders them peculiarly liable to those ecstasies (q.v.) which have been associated with the gift of divination from the priestess of the ancient heathen oracle down to the medium of modern spiritualism. Further, when witchcraft came to be prosecuted as heresy, the part assigned to woman in the Scripture account of the fall led to her being looked upon as specially suited to be the tool of the devil. Founded on this circumstance, a constant element of the creed of witchcraft came to be the belief in a carnal intercourse between witches and evil spirits. The devil was supposed to tempt them in the shape of a wooer, and the unholy compact was consummated in carnal fashion.

The bargain was usually in writing, signed with the witch's own blood. She was rebaptized, receiving a new name, and had to trample on the cross and renounce God and Christ (among Roman Catholics, also the Virgin Mary), in forms parodying the renunciation of the devil in the formula of Christian baptism. A mark was impressed on some part of her body; this mark remained forever after insensible, and was one of the means of discovery employed by the witch-finders. The powers conferred by Satan on these covenanted servants of his were essentially the same as had always been attributed to sorcerers; the mode of exorcising them was also the same, namely, by charms, incantations, concoctions, etc. The only change was in the theory. These mystic rites, instead of producing their effects by an inherent virtue, were merely symbols by which the witch conveyed her behests to the devil and his ministers, who obeyed them according to the compact. Another difference to be noted is, that the power was exclusively directed to work evil—to raise storms, blast crops, render men and beasts barren, inflict racking pain on an enemy, or make him pine away in sickness (which was usually done by making an image of wax, and sticking it full of pins, or setting it to melt away before the fire). If a witch attempted to do good, the devil was enraged, and chastised her. A remarkable circumstance is, that witches seem to have been powerless to serve their own interests, for they remained poor and miserable.

A prominent point in witchcraft was the belief in stated meetings of witches and devils by night, called *witches' Sabbaths*. First anointing her feet and shoulders with a salve made of the fat of murdered and unbaptized children, the witch mounted a broomstick, distaff, rake, or the like, and, making her exit by the chimney, rode through the air to the place of rendezvous. If her own particular demon-lover came to fetch her, he sat on the staff before, and she behind him; or he came in the shape of a goat, and carried her off on his back. At the place of assembly, the arch-devil, in the shape of a large goat, with a black human countenance, sat on a high chair, and the witches and demons paid homage by kneeling to him, and kissing his posteriors. The feast was lighted up with torches, all kindled at a light burning between the horns of the great goat. Among the viands there was no bread or salt; and they drank out of ox-hoofs and horses' skulls; but the meal neither satisfied the appetite nor nourished. After eating and drinking they danced to music played on a bagpipe with a horse's head for the bag, and a cat's tail for a chanter. In dancing, they turned their backs toward one

another. In the intervals they narrated to one another what mischief they had done, and planned more. The revel concluded with obscene debauchery; after which, the great goat burned himself to ashes, which were divided among the witches, to raise storms with. They returned as they came; and the husband was kept from being aware of the wife's absence by a stick being laid in the bed, which he mistook for her. The places of meeting were always such as had feelings of solemnity and awe attached to them, derived from tradition or otherwise; the more noted are known to have been places of sacrifice in heathen times (see WALPURGA).

The *prosecutions* for witchcraft form one of the most deplorable episodes in human history. They show more strikingly than anything else has ever done, on the one hand, what relentless cruelty human nature is capable of under the influence of a fanatical delusion; and on the other, how little reliance is to be placed on the concurrence of any number of witnesses when an extensive excitement prevails on a subject involving the sentiment of wonder. Multitudes will be found testifying, and testifying honestly, to alleged facts which fall in with the prevailing belief, but have no better foundation than their own heated imaginations.

In the early laws of Rome, the twelve tables, there were penal enactments against him who should bewitch the fruits of the earth, or conjure away his neighbor's corn into his own field. A century and a half later 170 Roman ladies were convicted of poisoning under the pretense of charms and incantations; which led to additional laws against such practices. But in all this, the penalties were directed against those who had done, or were believed to have done, positive injury to another; and this is probably the meaning of the Mosaic law against witchcraft. At all events, in the heathen world, the mere possessing, or being believed to possess, supernatural powers, was not in itself a crime. It was feared, no doubt, as being liable to be turned to malicious purposes; but on the whole, magic was looked upon as a beneficial art, being, in fact, the only form of the healing art known, and in part also the religion of domestic life. This view of the subject continued to prevail for many centuries after the reception of Christianity. Constantine, in the 4th c., while ordaining capital punishment for those who practiced noxious charms against the life or health of others, is careful to protect from prosecution all magical means used for good—such as warding off hailstorms and excessive rains (*Codex Justin.* lib. ix. tit. 18); and the distinction between *black* and *white* magic was long kept up. It was through the prosecutions directed against heresy, which were systematically organized in the 11th c. (see INQUISITION), that the magic arts came gradually to be all dyed black alike. Along with errors in doctrine, the heretics were almost always accused of magical practices, and their secret meetings were represented as a kind of devil-worship, attended with all kinds of abominations. Thus sorcery and heresy became synonymous, and to the dread of supernatural power was added the feeling of pious horror. White magic, no less than black, was now looked upon as the work of Satan; and the counter-charms against the malice of him and his agents were to be sought only in the rites of the church as ministered by the accredited servants of heaven. The belief in this ecclesiastical white magic was as zealously cultivated by the Protestant clergy as by the Roman Catholic.

Fostered chiefly by the proceedings against heresy, the popular dread of witchcraft had been on the increase for several centuries; and numerous executions had taken place in various parts of Europe. At last, Innocent VIII., by his celebrated bull, *Summis Desiderantes*, issued in 1484, gave the full sanction of the church to the prevalent notions regarding sorcery, and charged the inquisitors and others to discover and put to death all practicers of these diabolical arts. Two special inquisitors, appointed for Germany (to which country the bull was specially directed), Heinrich Institor and Jacob Sprenger, with the aid of a clergyman of Constance, Johannes Gremper, drew up the famous *Malleus Maleficarum*, or Hammer for Witches; in which the whole doctrine of witchcraft was systematized, a regular form of trial laid down, and a course of examination appointed by which inquisitors everywhere might best discover the guilty. From this we may date the beginning of the witch-mania proper. The edict of 1484 was subsequently enforced by a bull of Alexander VI. in 1494, of Leo X. in 1521, and of Adrian VI. in 1522—each adding strength to its predecessor, and the whole serving to increase the agitation of the public mind upon the subject. The results were dreadful. A panic fear of witchcraft took possession of society; every one was at the mercy of his neighbor. If any one felt an unaccountable illness, or a peculiar pain in any part of his body, or suffered any misfortune in his family or affairs; or if a storm arose, and committed any damage by sea or land, or if any cattle died suddenly, or, in short, if any event, circumstance, or thing occurred out of the ordinary routine of daily experience—the cause of it was witchcraft. To be accused, was to be doomed; for it rarely happened that proof was wanting, or that condemnation was not followed by execution. Armed with the *Malleus Maleficarum*, the judge had no difficulty in finding reasons for sending the most innocent to the stake. If the accused did not at once confess, they were ordered to be shaved and closely examined for the discovery of devil's marks, and if any strange mark was discovered, there remained no longer any doubt of the party's guilt. Failing this kind of evidence, torture was applied, and this seldom failed to extort the desired confession from the unhappy victim. A large proportion of the accused witches, in order to avoid these preliminary horrors, confessed the crime in any terms which were

dictated to them, and were forthwith led to execution. Other witches seemed to confess voluntarily, being probably either insane persons, or feeble-minded beings, whose reason had been distorted by brooding over the popular witchcraft code.

In Germany the prosecutions were carried to a frightful extent. In the small bishopric of Bamberg 600 fell victims to the delusion in the course of about four years; and in Würzburg, which is not much larger, 900. In the small district of Lindheim, a twentieth part of the population were sacrificed in the same space of time. Similar accounts are on record regarding the other countries of Europe. In Geneva, in three months (1515–16), 500 persons were burned. In the district of Como 1000 were burned in one year (1524), and 100 per annum for several years afterward. In France, about the year 1520, fires for the execution of witches blazed in every town; and throughout the century the provincial parliaments were incessantly occupied with witch-trials and enactments against them, especially against that form of the superstition known as lycanthropy (q.v.; see also WERE-WOLF).

In England and Scotland, the witch-mania was somewhat later in setting in than on the continent; but when it did so, it was little if at all less virulent—the reformation notwithstanding. The statute of Elizabeth, in 1562, first made witchcraft in itself a crime of the first magnitude, whether directed to the injury of others or not; and the act of James VI., in the first year of his reign in England, defines the crime still more minutely: "Any one that shall use, practice, or exercise any invocation of any evil or wicked spirit, or consult or covenant with, entertain or employ, feed or reward any evil or wicked spirit, *to or for any purpose;* or take up any dead man, etc.; such offenders, duly and lawfully convicted and attainted, shall suffer death." Many years had not elapsed after the passing of the statute, ere the delusion, which had heretofore committed but occasional local mischief, became an epidemical frenzy, devastating every corner of England. The poor creatures who usually fell victims are thus described by an able observer: "An old woman with a wrinkled face, a furred brow, a hairy lip, a gobber tooth, a squint eye, a squeaking voice, or a scolding tongue, having a ragged coat on her back, a spindle in her hand, and a dog by her side—a wretched, infirm, and impotent creature, pelted and persecuted by all the neighborhood because the farmer's cart had stuck in the gateway, or some idle boy had pretended to spit needles and pins for the sake of a holiday from school or work"—such were the poor unfortunates selected to undergo the last tests and tortures sanctioned by the laws, and which tests were of a nature so severe that no one would have dreamed of inflicting them on the vilest of murderers. They were administered by a class of wretches, who, with one Matthew Hopkins at their head, sprang up in England in the middle of the 17th c., and took the professional name of *witch-finders.* The practices of the monster Hopkins, who, with his assistants, moved from place to place in the regular and authorized pursuit of his trade, will give a full idea of the tests referred to, as well as of the horrible fruits of the witchcraft frenzy in general. From each town which he visited, Hopkins exacted the stated fee of 20s., and in consideration thereof, he cleared the locality of all suspected persons, bringing them to confession and the stake in the following manner: He stripped them naked, shaved them, and thrust pins into their bodies to discover the witch's mark; he wrapped them in sheets, with the great toes and thumbs tied together, and dragged them through ponds or rivers, when, if they sank, it was held as a sign that the baptismal element did not reject them, and they were cleared; but if they floated—as they usually would do for a time—they were then set down as guilty, and doomed. He kept them fasting and awake, and sometimes incessantly walking, for 24 or 48 hours, as an inducement to confession; and, in short, practiced on the accused such abominable cruelties, that they were glad to escape from life by confession. If a witch could not shed tears at command, said the further items of this wretch's creed, or if she hesitated at a single word in repeating the Lord's prayer, she was in league with the evil one. After he had murdered hundreds, and pursued his trade for many years —from 1644 downward—the tide of popular opinion finally turned against Hopkins, and he was subjected, by a party of indignant experimenters, to his own favorite test of swimming. It is said that he escaped with life, but from that time forth he was never heard of again.

The era of the Long Parliament was that, perhaps, which witnessed the greatest number of executions for witchcraft. *Three thousand persons* are said to have perished during the continuance of the sittings of that body, by legal executions, ir dependently of summary deaths at the hands of the mob. Witch-executions, however, were continued with nearly equal frequency long afterward. One noted case occurred in 1664, when the enlightened and just sir Matthew Hale tried and condemned two women, Amy Dunny and Rose Callender, at Bury St. Edmunds, for bewitching children. It is stated that the opinion of the learned sir Thomas Browne, who was accidentally present, had great weight against the prisoners. He declared his belief that the children were truly bewitched, and supported the possibility of such possessions by long and learned arguments, theological and metaphysical. Yet sir Matthew Hale was one of the wisest and best men of his time, and sir Thomas Browne had written an able work in exposition of popular fallacies! Chief-justices North and Holt were the first individuals occupying high places who had at once the good sense and the courage to set their faces against

the continuance of this delusion, and to expose the general absurdity of such charges (1694). Summary executions, however, continued for some years to be still common, in consequence of confessions extracted after the Hopkins fashion. In 1716, a Mrs. Hicks and her daughter, aged nine, were hanged at Huntingdon for selling their souls to the devil, and raising a storm by pulling off their stockings and making a lather of soap! With this crowning atrocity, the catalogue of murders in England closes.

In Scotland, witchcraft as a crime *per se* was first made legally punishable by an act passed in the reign of Mary (1563). On coming to execute the functions of majesty, James VI. made numerous official investigations into alleged cases of witchcraft, and derived a pleasure in questioning old women respecting their dealings with Satan. In 1590, James, it is well known, made a voyage to Denmark to bring home his appointed bride, the princess Anne. Soon after his arrival, a tremendous witch-conspiracy against the happy conclusion of his homeward voyage was discovered, in which the principal agents appeared to be persons considerably above the vulgar. The king had all the accused brought before himself for examination, and even superintended the tortures applied to them to induce confession. One of them, Mrs. Agnes Sampson, declared that one great object with Satan and his agents was to destroy the king: that they had held a great witch-convention at North Berwick for no other end; and that they had endeavored to effect their aim on many occasions, and particularly by raising a storm at sea when James came across from Denmark. The witches demanded of the devil why he bore such hatred to the king, who answered that the king was the greatest enemy he had in the world. On this occasion, 30 persons were executed on the Castle-hill of Edinburgh. These proceedings, no doubt, gave occasion to the famous work on Demonology which James VI. published shortly after. The removal of James to England moderated but did not altogether stop the prosecutions. As the spirit of Puritanism gained strength, however, they again increased. The general assembly was the body in fault on this occasion, and from this time forward, the clergy were the great witch-finders in Scotland. The assembly passed condemnatory acts (1640, 1643, 1644, 1645, 1649), and with every successive act the cases and convictions increased with even a deeper degree of attendant horrors than at any previous time. At a single circuit held at Glasgow, Stirling, and Ayr, in 1659, 17 persons were convicted and burned for this crime. The popular frenzy seems to have exhausted itself by its own virulence in 1661–62. After this period, the dying embers of the delusion only burst out on occasions here and there into a momentary flame. The last regular execution for the crime is said to have taken place at Dornoch in 1722, when an old woman was condemned by David Ross, sheriff of Caithness. The number of victims in Scotland from first to last has been estimated at upward of 4,000.

Cases of "witchcraft" occurred in some of the British colonies of North America during the 17th c. A few trials occurred in Virginia and Maryland; in Connecticut 5 or 6 persons were hung. In Connecticut and Massachusetts the penalty was not only in conformity with the Mosaic code, on which the laws were based, but also was borrowed directly from English common law. Plymouth colony was unvexed by the terrible delusion, but Boston and its vicinity were for a time under its cloud, and in 1692, at Salem, 19 persons were hung and one was pressed to death for the crime, when a complete revulsion of public feeling took place and the frenzy ended. Many histories of New England assert that Cotton Mather (q.v.) and other ministers were responsible for the rise and continuance of Salem witchcraft, but in the *North American Review* (Apr., 1869), Mr. W. F. Poole flatly contradicts the popular belief respecting Mather, and Thomas Brattle (q.v.) declared at the time that the clergymen almost throughout the country were very much dissatisfied with the extreme measures adopted.

Dr. Sprenger, in his *Life of Mohammed*, computes the entire number of persons who have been burned as witches during the Christian epoch at *nine millions*.

Throughout the middle ages, it is doubtful if one person could have been found who doubted the reality of witchcraft; and it was not till the middle of the 16th c. that any one had courage to raise his voice against the enormities which the delusion was occasioning. The first, probably, to do so was a physician of the name of J. Weier (*De Præstigiis Dæmonum*, etc.), in Germany, in 1563. He was followed in 1584 by Reginald Scot (q.v.), "a solid and learned person, beyond almost all the English of that age" (Hallam), who demonstrated the absurdity and impossibility of the prevalent notions. The delusion, however, was still in the ascendant, and found multitudes of defenders, who branded the skeptics as "Sadducees." The most prominent of these champions was James VI. of Scotland, who, through his treatise on Demonology (1597), and his activity in the inquisition of cases, is entitled to rank with pope Innocent and the inquisitor Sprenger, as at the same time a chief enemy and chief encourager of witchcraft. At last the world began to awaken from the horrid nightmare; the feelings of the humane began to be shocked by the continued butchery, and the more intelligent to question, if not the existence of witchcraft, at least the evidence on which the accused were for the most part condemned. Advocates took courage to defend a reputed witch, and judges (like North and Holt in England), to throw cold water on the proceedings; and the frenzy gradually subsided all over Europe. Individual cases occurred later on the continent than in Britain. A man was executed at Würzburg, in 1749, on a charge of sorcery; and a witch was burned at Glarus, in Switzerland, in 1782. Perhaps the latest

instance of a judicial execution for witchcraft occurred in 1793, in the grand duchy of Posen. The laws against witchcraft were formally repealed in England in 1736; in Austria, not till 1766.

The cessation of judicial proceedings, however, did not all at once put an end to popular outrages on supposed witches. In 1751 an aged female pauper and her husband were killed by a mob near Tring, in Staffordshire; and for the murder, one of the perpetrators was tried and executed. Not longer ago than 1863, a reputed wizard was drowned in a pond at the village of Hedingham, in Essex; and it was considered worthy of notice that nearly all the sixty or seventy persons concerned in the outrage were of the small-tradesmen class, none of the agricultural laborers being mixed up in the affair. Besides such violent outbreaks, striking revelations are frequently made in the course of judicial proceedings, how deep-seated and general the dread of witches continues to be throughout the more ignorant strata of European society, especially in rural places; and, concurrent with this, the faith in the skill of certain "wise men" and "wise women" (white witches) to counteract their malicious practices. As recently as March, 1867, a man calling himself Dr. Harris (S. Wales), was committed for trial at the next Radnorshire assizes, for duping various persons, by persuading them that their ailments were caused by their being "witched," and pretending to cure them by giving them written charms to wear. From one man he had extorted £4, from another £6, and so on.

The belief in magic or sorcery, in fact, continues to be the most energetic belief of the ignorant and degraded all over the world, no matter what their nominal religion is. To the mass of the adherents of Buddhism in central Asia, the lama or priest is merely a wizard who knows how to protect them from the malignity of evil spirits; and, according to Livingstone and other travelers, trials and executions for witchcraft are at this day common throughout Africa, as they were in Europe in the 17th c., and under forms ludicrously similar. See ORDEAL, MAGIC.

Of the numerous books written about witchcraft, we note the following: *Sadducismus Triumphatus, Sadducism Vanquished, or, Considerations about Witchcraft*, a work vindicating the belief in witchcraft, by Dr. Joseph Glanvil, chaplain-in-ordinary to Charles II., who was one of the first fellows of the royal society, and wrote a meritorious treatise showing the value of skepticism in science. R. Baxter (q.v.), in his *Certainty of the World of Spirits*, upholds the same side. Balthazar Bekker, a Reformed Dutch clergyman, was the first, at the end of the 17th c., to attack the very foundation of the superstition—namely, the belief in the devil himself, or, at all events, in the possibility of his interference in the affairs of this world. A successor of Glanvil—D. F. Hutchinson, chaplain to George I., in his *Historical Essay concerning Witchcraft* (1718), writes from the skeptical point of view. Sir W. Scott, *Letters on Demonology and Witchcraft*, entertaining, but superficial. Brand's *Popular Antiquities of Great Britain*, edited by sir H. Ellis (1855), gives a collection of witch-beliefs put together without much connection or method. H. Williams's *Superstitions of Witchcraft* (1865) takes a wide historical view of the subject, and evinces extensive reading. C. Mackay gives a good digest of it in brief space in a section of his work on *Extraordinary Popular Delusions* (1841). Thomas Wright's *Narratives of Sorcery and Magic*, 2 vols. (1852), contains a large collection of the most interesting stories of individual cases. Soldan, *Geschichte der Hexenprocesse* (Stutt. 1843); Ennemoser, *Geschichte der Magie*, 2d ed. (Leip. 1844; translated by W. Howitt, Lond. 1854). L. F. Alfred Maury, *La Magie et l'Astrologie dans l'Antiquité et au Moyen Age* (Lond. 1860), attempts to give a philosophy or theory of all superstitious beliefs. J. Grimm, *Deutsche Mythologie*, with his wonted sagacity and prodigality of learning, traces the several elements of the witch-creed to their roots in the beliefs of pagan times. Haas, *Die Hexenprocesse* (1865); Roskoff, *Geschichte des Teufels* (1869); Buckle, *History of Civilization* (1857–61); Lecky, *History of Rationalism* (1865); Tylor's *Primitive Culture* (1871); Conway, *Demonology and Devil Lore* (1878).

WITCH-HAZEL, *Hamamelis Virginica*, a North American shrub of the natural order *hamamelidaceæ*. This order contains only a very small number of species, much diffused over the world, but none of them European; shrubs or small trees, with alternate, stipulate, feather-veined leaves, and small axillary unisexual flowers. The witch-hazel is often not more than 6 or 8 ft. in height, dividing at the base into several cylindrical grayish branches. Sometimes it attains a height of 20 or 30 feet. The leaves are about four inches long, and two or three broad. The flowers are clustered, yellow and showy, with long linear petals. They appear in winter, or at the season when other trees and shrubs are parting with their leaves. The English name is derived from the supposed virtues of a forked twig as a divining-rod. The bark is much esteemed as a sedative and discutient. The name is usually spelled as above, though some insist on the form Wych-Hazel.

WITENA-GEMOT (A.-S. *witena*, genitive plu. of *wita*, a wise man, from *witan*, to know, and *gemót*, assembly, from *metan*, to meet), the great national council of England in Anglo-Saxon times, by which the king was guided in all his main acts of government. Each kingdom had its own witena-gemót before the union of the Heptarchy in 827, after which there was a general one for the whole country. It was composed of the chief ecclesiastics, the ealdormen (see ANGLO-SAXONS) of shires, and some of the chief proprietors of land. It would rather appear, though the latter is not quite free from doubt, that the lesser thanes, who formed part of the *scir-gemót*, or next inferior court, were not

entitled to form part of the general council. In the year 934, there were present at one of these assemblies king Athelstane, four Welsh princes, two archbishops, seventeen bishops, four abbots, twelve dukes, and fifty-two thanes.

The powers of the witena-gemót seem to have been very extensive. The king's title, however, hereditarily unexceptionable, was not considered complete without its recognition, and it possessed the power of deposing him. It could make new laws and treaties; and along with the king it appointed prelates, regulated military and ecclesiastical affairs, and levied taxes. Without its consent, the king had no power to raise forces by sea or land. It was also the supreme court of justice, civil and criminal. The Witena-gemót was abolished by William the Conqueror, and its powers were only in part transmitted to parliament.—See Hallam's *Middle Ages*, c. 8; sir F. Palgrave's *Rise and Progress of the English Commonwealth;* and Kemble's *Saxons in England.*

WITHDRAWING A JUROR, a somewhat clumsy method by which a trial is brought to a close after the impaneling of the jury, without either non-suiting the plaintiff or giving him a verdict. It usually takes place at the suggestion of the court when some unlooked-for event renders further trial at the time obviously improper. The agreement of the parties is necessary. The effect of withdrawing one of the twelve jurors from the box is to put an end to that trial, leaving the parties to pay each his own cost.

WITHER, George, was b. on June 11, 1588, at Bentforth, an estate in Hampshire of which his father was proprietor, and which in due course fell to the son. He was educated at the grammar-school of Colemore, and afterward at Magdalen college, Oxford, which he entered in 1604. He remained there several years, and after passing some time at home, he went to London, and entered himself at Lincoln's inn. His bent was, however, rather to literature than law; and he shortly became known in certain circles as a writer of clever verses. In 1613 he came before the public in a volume of satire, the title of which, *Abuses Stript and Whipt*, in some sort defines its contents. Certain things in the book were considered offensive by the authorities, and he was sent to the Marshalsea prison, and kept there for some months. During his imprisonment were composed his *Satire to the Kings* and his *Shepherd's Hunting*. In 1622 appeared a collection of his poems under the title *Mistress of Philarete*, and in 1635 his *Emblems, Ancient and Modern*. Though he had very much identified himself with the party of the Puritans, among whom his writings were most popular, on the breaking out of civil disturbance, he served as a captain of cavalry in the ill-judged and abortive expedition of Charles I. against the Scotch covenanters in 1639. When a little later, however, the general discontent determined itself into the grand struggle between the king and the English parliament, he promptly sided with the latter, and raised a troop of horse for its service by the sale of his estate. In the army of the parliament he attained the rank of major; but of his special services not much is known. On one occasion he was taken prisoner, and is said to have owed his life to a joke of Denham's, who besought the royalists to spare his life, on the ground that so long as Wither lived, he (Denham) was not the worst poet in England. On the final triumph of the side with which he had ranged himself, it appears that opportunities were afforded him of feathering his nest rather comfortably by the spoil of the defeated party. With the restoration naturally a reverse came; and as the reputed author of a pamphlet entitled *Vox Vulgi*, of a so-called seditious tendency, he was committed to the tower, and an impeachment of him having been ordered, his life for a time seemed to be in some danger. The impeachment was not, however, proceeded with, and sooner or later—the date seems somewhat uncertain—he obtained his liberty. He died in London on May 2, 1667.

WITHERS, Frederick C., b. Somersetshire, Eng., 1828; educated at King Edward's school, Sherborne, Dorset. He was articled to an architect for five years, and having further studied architecture with leading architects in London, he came to the U. S., 1852, at the invitation of the late A. J. Downing. In 1854, he entered into partnership with Calvert Vaux. Afterward he practised his profession in Newburgh, N. Y., designing numerous buildings, among others, the First Pres. church, Newburg. Immediately after the battle of Bull Run, he joined the army, being commissioned as first lieut. of a vol. corps of engineers. After a year's service, he retired, invalided, and again became partner with Mr. Vaux, in New York, the partnership later being increased by the addition of Frederick Law Olmsted. Among the public buildings designed by Mr. W. are the Hudson River State Hospital at Poughkeepsie, the savings bank at Newburg, the buildings of the Columbia institution for the deaf and dumb at Washington, the Jefferson Market court house and prison, in New York, and the Astor Memorial in Trinity church, New York; besides many churches, schools, and private residences. Since the close of the partnership, he has practised in New York. He is the author of *Withers' Church Architecture.*

WITHERS, Jones Mitchell, b. Ala., 1814; graduated West Point, 1835; commissioned in the cavalry and resigned the same year. He served in the Creek troubles and the Mexican war. From 1848 to 1861 he was engaged in business in Mobile, and for the last ten years was mayor of the city. He entered the confederate service in 1861; was made a brig.-gen.; commanded a division at the battles of Shiloh and Stone river, and was promoted to be maj.-gen. After the war he became editor Mobile *Tribune.*

WITHERS, Robert Enoch, b. Va., 1821; educated at the university of Virginia, where he took a medical degree. He served in the confederate army during the civil war, edited the *Lynchburg News*, 1866–68, was lieut.-gov. of Va., 1873; U. S. senator from that state, 1875–81; U. S. minister to Hong Kong (1885).

WITHERSPOON, John, d.d., ll.d., 1722–94; b. Scotland; educated at the university of Edinburgh; minister of different parishes, 1745–68; pres. of the college of New Jersey, 1768–94, and prof. of divinity; during the suspension of the college by the war, was, in 1776, a member of the constitutional convention of New Jersey, and, for six years, of the Continental congress, where he sat "in full clerical dress;" advocated and signed the Declaration of Independence and the articles of confederation; an active member of several important committees and of the board of war, visiting the camps to increase the comfort of the troops; when the college was re-opened lectured there on moral philosophy and rhetoric; raised greatly the reputation of the institution, and improved its financial affairs; visited England in 1783 and 1784 to solicit funds, but with little success; was blind the last two years of his life. His works were collected at New York in 4 volumes, 1800, and at Edinburgh in 9 volumes, 1804. Among them are, *Ecclesiastical Characteristics; Essay on Justification; Serious Inquiry into the Nature and Effects of the Stage; Legislative Authority of the British Parliament; Essays on Important Subjects; Essay on Money;* and *The Druid*. A statue of him was erected at Fairmount park, Philadelphia, during the centennial exhibition, 1876.

WITNESS, a person summoned, or capable of being summoned, by a court of law, or some officer authorized to take evidence relating to a judicial or other proceeding. All persons are liable to be witnesses, either voluntarily or involuntarily, and it is a duty which every citizen owes to his fellow-citizens, to be available whenever his testimony is deemed desirable. It is a compulsory duty, and the presence of any person can be enforced, both in civil and criminal cases. In England the usual mode of summoning a witness in a court of law, is by serving him with a *subpœna*, i.e., a formal writ proceeding in the queen's name, reciting that a certain action is pending in a court named, and a trial is to take place, and commanding the witness to lay aside all and singular business and excuses, and appear at the time and place before the court mentioned, under a penalty (*sub pœnâ*) of £100. This is called a *subpœna ad testificandum*. The corresponding term in Scotch law is diligence (q.v.). If the witness is required to produce a document in his possession, it is called a *subpœna duces tecum*, and he is told in the writ to bring the document. If a witness do not attend at the time and place mentioned, he is liable to be punished, either by attachment, i.e., summary imprisonment for contempt, or by an action for damages at the suit of the party summoning him. The subpœna, or notice to attend, must be served a reasonable time before the witness is wanted, and it is generally necessary to give a day's notice beforehand. During a witness's attendance on this public duty, he is privileged from arrest: thus, he cannot be taken into custody for debt while he is going to, remaining at, or returning from the court. Moreover, he is entitled, before he go to the court, to have his reasonable traveling expenses paid to him, and a sum for subsistence while he remains in attendance. He is also entitled to a reasonable allowance for his lost time while attending a civil trial, and courts of law allow 5s. per day to a laborer or journeyman, 7s. 6d. to a master-tradesman, and £1 1s. to £3 3s. to professional men; to females, according to their station in life. A witness may, in a civil case, but not in a criminal case, refuse to give evidence until his expenses are paid. A witness, before examination, is required to take an oath, which may be in any form which he considers most binding on his conscience; but he must at least believe in a God and a future state of rewards and punishments. When a witness is examined, he is generally asked specific questions, first, by the party calling him, and during this examination in chief, the rule is that he is not to be asked leading questions, i.e., questions which suggest the answer that is required. The opposite party is then allowed to cross-examine the witness, and in doing so, may ask leading questions, or test in every way the truth of witness's statement. After this, the witness is re-examined. There is a technical rule that the party calling a witness is not allowed to impeach his credit, or ask anything having that effect. There are certain questions which a witness may refuse to answer. Such are questions the answer to which might render the witness liable to a criminal charge or penalty; but he cannnot refuse if the effect would merely be to render him liable to a civil action, or merely to degrade him. If a witness live in a foreign country, he cannot be compelled to come to this country by any subpœna, and therefore the only way of getting his evidence is to send a commission to some person in the foreign country to take the examination there. Where, however, a witness residing in Scotland is required for a trial in England, and *vice versa*, he may now be compelled by subpœna to attend in the same way as if he had resided in England or Scotland respectively. If the witness is aged or infirm, so that his attendance at the trial would be dangerous to him, he may be examined by a commissioner or examiner before trial. In England, when a witness is sworn, a New Testament is put in his hand, and after the officer of court repeats the form he kisses the book. This form is "The evidence you shall give to the court and jury, touching the matter in question, shall be the truth, the whole truth, and nothing but the truth." When the witness is a Jew or foreigner, the form varies. In Scotland, the witness, when sworn, stands, holding up his right

hand, while the judge of the court repeats this form: "I swear by Almighty God, as I shall answer to God at the great day of judgment, that I shall tell the truth, the whole truth, and nothing but the truth, in so far as I know or shall be asked."

A witness is incompetent to testify if too young to understand the obligation of the oath, or, for other reasons, insensible to such obligation · if insane or intoxicated, or convicted of infamous crimes, if party to the record or directly interested in the result of the suit, or if in possession of privileged communications (such as an attorney's consultation with clients, or state secrets); husband and wife are incompetent to testify against each other. *These are common law rules*, and are greatly modified by the statutes of the states; the tendency being very strong to admit witnesses, and allow the jury to judge of their credibility. Thus, parties are allowed to testify in their own behalf in civil, and in most states, in criminal cases; and in many cases husband and wife may testify against each other. A party cannot be compelled to testify against himself, nor need a witness answer questions tending to incriminate himself. But an accused person, if he chooses to go on the stand, is subject to cross-examination. The U. S. judiciary act, 1793, provides that in cases not covered by the U. S. constitution, treatises, or statutes, the laws of evidence of the states shall govern in U. S. courts. In all states persons having conscientious scruples against taking an oath are allowed to affirm.

WITNEY, a small market and manufacturing t. of Oxfordshire, in a dreary district on the Windrush, 10 m. w.n.w. of Oxford. It is a neat and well-built town, consisting principally of two streets. There is a spacious cruciform church, a blanket-hall (built 1721), a town-hall, and cross (1683). It is celebrated for its blankets, which are distinguished for their peculiar whiteness, communicated, it is said, by the sulphurous qualities of the waters of the Windrush, used in their manufacture. This branch of industry has, however, somewhat declined, from the introduction of machinery for blanket-making in other towns. Gloves, malt, pilot-cloths, and felting for paper are also manufactured. The Saxon form of the name is *Witaneye*, and means, "the island of the wise men," or "the island of the parliament." Witney is connected by a branch with the Great Western railway. Pop. '81, 3017 ; '91, 3110.

WITTEKIND, a Westphalian chieftain, the most celebrated leader of the Saxons against Charles the Great, made his first appearance as leader in the expeditions which the Saxons undertook in 774 against the fortress of Eresberg, in Westphalia, and the Frankish province of Hesse, while Charles was subduing the Lombards. When most of the Saxon nobles submitted to the emperor Charles at the imperial diet at Paderborn in 777, Wittekind fled to Siegfried, king of Jutland, whose sister Geva he is said to have married. In 778 he returned, and when Charles was absent in Spain, began to lay waste the Rhine country. Charles's return obliged him again to take refuge in Jutland; but in 782 he fell upon the Frankish army by surprise at the Sintleberg, and entirely annihilated it—an act for which Charles took frightful vengeance by the execution of 4,500 Saxons. On this, all the Saxon tribes rose in arms, and the war was again led by Wittekind until 785, when Charles entered into negotiations with him, the result of which was that Wittekind repaired to the emperor's camp at Attigny in Champagne, and received baptism. After that, he appears no more in history. According to the legend, however, that is still current among the people in Westphalia, Charles promoted Wittekind to be duke of the Saxons, and made over Engers to him. From his castle, called Babilonie, situated in the neighborhood of Lübeck, he is said to have ruled with gentleness and justice till 807, when he met his death in a campaign against duke Gerald of Swabia. His bones repose in the parish church of Engers, in the duchy of Ravensberg, where Charles IV., in 1377, erected a monument to him; and on Oct. 18, 1812, another monument in his honor was erected at Minden by the Westphalian society. The higher of the two hills which form the Westphalian gates on the Weser, near Minden, bears the name of Wittekindsberg.

WITTEN, a t. in Westphalia, Prussia, on the Ruhr river, 31 m. n.n.e. of Cologne: pop. '90, 26,310. Much coal is mined in the surrounding district, and there are extensive manufactures of machinery, iron, steel, and glass.

WITTENBERG, a t. of Prussia, province of Saxony, on the Elbe, 55 m. s.w. of Berlin. It is no longer a fortified place, though till 1873 it was a fortress of the third rank. It is interesting as having been the capital of the electorate of Upper Saxony, as the cradle of the reformation, and as containing the remains of the reformers Luther and Melanchthon. The once famous university, in which Luther was professor, and mentioned by Shakespeare as the school where Hamlet studied, is now removed and incorporated with that of Halle. In the *Stadt-Kirche* are two remarkable but poor pictures supposed to be by their contemporary and friend Cranach, in one of which Melanchthon is represented as dispensing the sacrament of baptism, and Luther as preaching to a congregation, of which the two foremost figures are his wife and son. In the *Schloss-Kirche* are the tombs of Luther and Melanchthon, as well as those of Frederick the Wise (with a noble bronze statue by Vischer) and John, electors of Saxony. Upon the doors of this church—burned down by the French, but replaced by others of metal—Luther hung up his 95 theses against the papal doctrine of indulgences. The house of the great

reformer, containing his chair, table, etc., and two portraits of him by Cranach, remains almost unaltered. The houses of Melanchthon and Cranach are also shown. In the market-place is a bronze statue of Luther by Schadow, not far from which is also one of Melanchthon; and outside the Elster gate, a spot is pointed out where Luther burned the papal bull. Manufactures of woolen and linen goods, hoisery, and leather are carried on. Brandy is distilled, and beer brewed. Pop. '90, 14,458.

WOAD, *Isātis*, a genus of plants of the natural order *cruciferæ*, having a one-celled, one-seeded, laterally compressed pouch, with the valves keeled and eventually separating. It contains only a few species, mostly natives of the countries around the Mediterranean. Dyer's Woad (*I. tinctoria*) is sometimes found in cultivated fields in England, but most probably has been introduced, as it was formerly much cultivated both in England and Scotland, for the sake of a blue dye obtained from its root-leaves. The use of this dye has in great part ceased, in consequence of the more general introduction and diminished cost of indigo. Dyer's woad is a biennial plant, with oblong crenate root-leaves about a foot in length, on pretty long stalks; an upright, much branched leafy stem, about 3 ft. high; small yellow flowers, and large seed-vessels, about half an inch long and 2 in. wide, hanging from slender stalks. The leaves when cut are reduced to a paste, which is kept in heaps for about 15 days to ferment, and then formed into balls which are dried in the sun, and which have a rather agreeable smell, and are of a violet color within. These balls are subjected to a further fermentation before being used by the dyer. When woad is now used, it is always in union with indigo, which improves the color. Even by itself, however, it yields a good and very permanent blue. It is supposed that woad was the dye used by the Picts for painting their persons. Woad is now cultivated only to a very small extent in Britain.

WOBURN, a city in Middlesex co., Mass.; on the Boston and Maine railroad; 10 miles n.e. of Boston. It was located in 1640, incorporated as a town in 1642, and chartered as a city in 1889, and contains several villages. There are a high school, public library, electric lights, electric street railroads, waterworks owned and operated by the city, national and savings banks, and weekly and monthly periodicals. Woburn is the largest leather manufacturing place in New England, and also manufactures electric lamps and dynamos, glue, chemicals, and shoes. Pop. '90, 13,499.

WODEN. See Odin.

WODROW, Robert, the second son of James Wodrow, professor of divinity in the university of Glasgow, was b. at Glasgow in the year 1679. He was educated at the university of his native city, and after passing through the classes in arts, studied theology under his father. At an early age he devoted a considerable portion of his time to historical researches, and to this taste he probably owed his appointment as librarian to the university. He did not hold this office long. Having finished his theological studies, in the year 1703 he received a license to preach from the presbytery, and in the month of October of the same year was appointed minister of Eastwood, a parish in the co. of Renfrew, at no great distance from Glasgow. In that parish he remained till his death, faithfully discharging the duties of his office, and declining offers which were made to him of appointments to pastoral charges of more importance. He had been brought up in the strictest principles of Presbyterianism, and he zealously adhered to the party in the established church, which was most strenuous in maintaining those principles, and in resisting what were deemed to be the encroachments of the secular power. Soon after his settlement at Eastwood, he began to devote his leisure hours to what became the chief object of his life—the writing of a history of the church of Scotland from the restoration to the revolution. He spared no pains and no expense, so far as his limited means could afford, in collecting materials for this work. He corresponded with all persons who could give him any information, and transcribed with his own hand the civil and ecclesiastical records bearing on his subject. The work was published in 2 folio vols., the first in 1721, and the second in the following year. It was dedicated to king George I., whom the author styles "the best as well as the greatest of kings;" and in the year 1725 he received an order on the Scottish exchequer for £105, as a mark of the royal bounty. It is probable that this sum was the chief pecuniary recompense of his labors; but considerations of that nature formed no part of the inducements which had led him to undertake the work. A second edition of the history, in 4 vols. 8vo. was published at Glasgow in 1828, under the editorship of Dr. Robert Burns. Wodrow contemplated other works, chiefly of a biographical character, illustrative of the ecclesiastical history of Scotland. None of these were published till the present century. Two vols. of his collections on *The Lives of the Scottish Reformers and Most Eminent Ministers*, and 4 vols. entitled, *Analecta, or a History of Remarkable Providences*, have been printed by the Maitland club. Three vols. of his correspondence were published by the Wodrow society—a literary club called after his name, and instituted in 1841 for the publication of the works of the fathers and early writers of the reformed church of Scotland. This correspondence, which extends from the year 1709 to the year 1731, throws much light on the ecclesiastical history of the time, and contains letters addressed to persons of some note in their day, not only in Scotland, but in England, Ireland, and North America. Wodrow's health was impaired by the eagerness with which he prosecuted his laborious studies. He died Mar. 21, 1734, in the 55th

year of his age. His great work—the one by which his name is generally known—is the history. It is what it professes to be in the title-page, a "History of the Sufferings" of the Presbyterian church, rather than an ecclesiastical history of the period. This of itself implies a one-sided character, and warns its readers that they need not expect an account of events not coming within its limited range. Of its great value as a store-house of materials to the student of Scottish history, no one who has examined its pages can have a doubt. As little hesitation will there be in regard to the absence of every grace of style. The only question will be as to the degree of credit to be given to the facts which the writer relates. So far as concerns his fidelity in transcribing records, and incorporating in the text the narratives furnished to him, there is no reason to doubt his general accuracy. But beyond this nothing can be said. His credulity was so great as to make him entirely unable to give any weight to intrinsic improbabilities or the conflict of external evidence. He could rarely admit a fault in those of his own side, and it is hardly an exaggeration to say that he could never see a virtue in his opponents. Much of his history is gathered from the records of the privy council of Scotland, and an examination of these valuable and voluminous papers will make it pretty evident that Wodrow disingenuously neglected to extract particulars which tell against his party. It is obvious, therefore, that in the perusal of his work, allowance must be made, not only for the absence of whatever does not come within its proper subject, but also for exaggerations of the virtues and sufferings of one party, and the crimes and errors of the other. The fullest memoir of Wodrow is that which is prefixed by Dr. Burns to his edition of the history. Interesting details of his domestic life and of his labors and studies will be found in the printed volumes of his correspondence.

WOFFINGTON, Margaret, 1720–60, b. Dublin, Ireland, of poor parents. When a child she appeared in an itinerant show troupe. Her first appearance as an actress in comedy was in Dublin, and she there made a great success. In 1740 she played at Covent Garden theater, London; became a popular favorite and remained there until 1757, when she retired from the stage. For some years she lived with Garrick, but quarreled with him. The last part of her life was spent in respectable retirement.

WÖHLER, or **WOEHLER,** Friedrich, an eminent German chemist, was born near Frankfort-on-the-Main in 1800, and died in 1882. He studied medicine and chemistry at Marburg and Heidelberg, was for a time professor of technology and chemistry in the Polytechnic School at Cassel, and in 1836 became professor of medicine and director of the Chemical Institute at Göttingen. Among his works are *Principles of Chemistry* (1840), and *Practical Exercises of Chemical Analysis* (1854).

WOJWODA (Polish, *Wojewoda*), an old Slavonic word (composed of *woi*, warrior, and *wodit*, to lead), means, literally, army-leader or general, and was from early times used by most Slavonic nations in this sense. Afterward, it became the title of the elective princes before hereditary monarchies were formed. Thus, at one time, the princes of Walachia and Moldavia were called Wojwodes; from the Greek emperors, with whom they had been in intimate alliance from the year 1439, these princes next received the title of despots, a title they afterward exchanged for that of Hospodar. The name was also given to the elective princes of Transylvania, whether dependent or independent. The same title of Wojwoda was applied to the elective chiefs of the Polish government before the beginning of the Piast dynasty. Later, the name denoted office and dignity; and was given in the former kingdom of Poland, to the governors in the districts, or Wojwodschafts, into which the kingdom was divided. They had at first only a military authority; afterward, however, both the civil and military were united in one person, so that Wojwoda and Palatine were one and the same. The name of Wojwodschaft was preserved in Russian Poland till recent times; now the Polish Wojwodschafts are named uniformly with the other Russian "governments." From 1849 till 1860 the Banat and part of the military frontier constituted a separate Austrian crownland, called "the Servian Woiwodina and Temeser Banat."

WOLCHOW or Volkhov. See Ilmen, Lake, and Ladoga, Lake.

WOLCOT, Dr. John, better known under the pseudonym of *Peter Pindar*, was born at Dodbrooke, in Devonshire, in 1738. He was educated at the charge of his uncle, a respectable surgeon and apothecary of Fowey, in Cornwall. After studying medicine at the London hospitals, he accompanied sir William Trelawny to Jamaica in the capacity of medical attendant, but finding his professional income too small for his wants, he solicited and obtained a church-living in the island. His congregation consisted mostly of negroes, and Sunday being their principal holiday and market, the attendance at church was very limited. Sometimes not a single person came; and Wolcot and his clerk—the latter being an excellent shot—used at such times, after waiting for ten minutes, to proceed to the seaside, to enjoy the sport of shooting ringtailed pigeons. The death of his patron, Trelawny, induced him to abandon both Jamaica and the church. Returning to England, he tried to establish himself as a physician at Truro, in Cornwall, but does not appear to have succeeded. At any rate, he soon removed to London, where he gave himself up to writing audacious squibs and satires in verse, on all sorts of persons, from king George III. down to the liverymen of London, and even lower. Wolcot's line in literature is not a very respectable one, and most people would

probably prefer obscurity to a reputation like his; but, to do him justice, *Peter Pindar* is an excessively clever writer. Unscrupulous, impudent, and coarse, he is yet a master of burlesque humor and comic caricature: his verse is easy, vigorous, and idiomatic; and his fancy rich in the production of ludicrous metaphor. Two of his raciest pieces leveled at his sovereign, are *The Apple Dumplings and a King*, and *Whitbread's Brewery visited by their Majesties*. Besides these we may mention his *Lyrical Odes* on the royal academy exhibition (the earliest of his London efforts, and dating from 1782); *Bozzy and Piozzi, or the British Biographers; Peeps at St. James's; Epistle to a Fallen Minister; Odes to Mr. Paine;* and the *Lousiad, a Heroic-comic Poem*, in five cantos, etc. The *Lousiad* has its foundation in the fact that an obnoxious insect had been discovered in the king's plate among some green peas, which produced a solemn decree that all the servants in the royal kitchen were to have their heads shaved. Some of Wolcot's serious effusions actually possess considerable merit. If the matter, or rather the themes of his verse, had been less worthless, it would have stood a better chance of permanent popularity. In his own lifetime, his pieces were greedily read, and he had an annuity from the booksellers of £250 for the copyright of them. He was considered so formidable a personage that the ministry are said to have endeavored to bribe him into silence. Wolcot, who records this proof of his power, also asserts the incorruptibility of his patriotism. He died Jan. 14, 1819.

WOLCOTT, Edward Oliver, U. S. senator; b. in Longmeadow, Mass., in 1848; served for a few months as a private in the Ohio volunteers in 1864, and two years later began a course of study at Yale. He graduated at the Harvard law school in 1871 and, removing to Colorado, began practice as a lawyer. He was elected to the U. S. senate as a republican in 1888 and re-elected in 1894. He has been one of the prominent members of the free silver party, and in 1897 was a member of the commission sent to Great Britain to ascertain the attitude of the British government on the silver question.

WOLCOTT, Oliver, ll.d., 1726–97; b. Conn.; son of Roger. He graduated at Yale college in 1747; and, during the French wars, commanded a company stationed on the n. frontier. He was sheriff of Litchfield co. in 1751; a member of the council, 1774–86, and in the mean time judge of the court of common pleas, and of the Litchfield co. probate court. In 1775 congress appointed him a commissioner for Indian affairs. The next year he was put in command of the Connecticut forces enlisted to co-operate with the army in New York. The same year he entered congress which he left for the field soon after the promulgation of the declaration of independence, of which he was a signer. He took part in the battle of Saratoga. He still served in congress from time to time till 1783. He was lieutenant governor of Connecticut, 1786–96, and governor from the latter date till his death.

WOLCOTT, Oliver, ll.d., 1760–1833; b. Conn. educated at Yale college. He took part in the revolutionary war as an aid to his father, Oliver, and as an officer in the commissary department. He was called to the bar in 1781; was U.S. controller, 1788–89, and auditor of the U.S. treasury, 1789–91. He was again controller, 1791–95, when he became secretary of the treasury. On leaving that office in 1800, he was appointed U.S. circuit judge, which office he held for 2 years. He was a merchant in New York till 1812, when, in association with his brother Frederick, he founded large factories at Wolcottville, near his native town, Litchfield. He was governor of Connecticut, 1818–27, when he returned to New York.

WOLCOTT, Roger, 1679–1767; b. Windsor, Conn.; commissary of the Connecticut troops in the expedition against Canada in 1711. He served also in the succeeding French wars, and rose to be maj.gen. He was governor of Connecticut, 1761–65, after serving several terms in the legislature, in the council, and on the bench of the county court, and of the superior court. He was also deputy-governor. He was the author of *Poetical Meditations* (1725), containing a poem called *A Brief Account of the Agency of the Honourable John Winthrop, Esq., in the Court of King Charles II.*

WOLF (corresponds to Lat. *vulpes*, a fox), the name of a wild animal of the same genus with the dog, and of which it is indeed doubtful if it constitutes a distinct species; while, as to the different kinds of wolves found in different parts of the world, it must be deemed at present wholly uncertain whether they are to be regarded as species or varieties, although they have, provisionally, received specific names. There exists among them the same close resemblance as in the different kinds of dog, with a similarly marked distinction of characters, which, however, it is difficult to state as specific characters are generally stated. The same difficulty, therefore, occurs in the natural history of wolves as in that of dogs, although the number of different forms is not so great. In their most important characters, and those which, as least subject to variation, are generally regarded as best marking specific distinction, they agree not only with each other, but with dogs. The opinion, that the wolf is the parent of the dog, or of some of the kinds of dog, is favored by the identity of the period of gestation, a point which seems to be pretty well established, and which, in such a question, is to be regarded as of great importance. Dogs and wolves also intermix, but it is not yet fully ascertained that the offspring will continue fertile among themselves. It is further observed that wild races of dogs, whether originally wild, or having become wild (*feral* races), resemble wolves in many respects, in their dull uniformity of color, in their

lengthened muzzle, lengthened limbs, lank form, and gaunt aspect, and even in the bushiness of the tail. It has been alleged, as a reason against supposing the wolf and the dog to be really of the same species, that the wolf is incapable of domestication and of attachment to man. This, however, is not the case. Both the common wolf of the old world and the wolves of America have been found capable of domestication, when taken young, and instances are on record of their having displayed an attachment to their master like dogs.

The COMMON WOLF (*Canis lupus*) inhabits Europe and the northern parts of Asia, its range extending from the Arctic regions as far s. as the northern parts of Africa and of India. It is of a yellowish or tawny-gray color, with strong coarse hair, which is longest on the ears, neck, shoulders, and haunches, but particularly on the throat; the muzzle is black, the upper lip and chin white. The ears are erect and pointed, the muzzle sharp; the legs rather longer than those of the shepherd's dog; the tail bushy, but not curling; the eyes oblique, giving a peculiar vicious expression to the countenance. The wolf is swift of foot, and hunts deer and other animals, packs of wolves associating for this purpose; it also often commits great ravages among sheep, and attacks calves, but seldom full-grown oxen. It seldom attacks man, unless hard pressed by hunger, when it becomes very dangerous. The hungry wolves which sometimes descend, in severe winters, from the forests of the Alps, Pyrenees, and other mountains, are much dreaded by the inhabitants of neighboring regions; and terrible stories are told of travelers chased by packs of wolves in the forest-covered plains of the e. of Europe and in Spain. In general, the wolf is cowardly and stealthy, approaching sheepfolds and farm-buildings by night, in search of prey, and readily scared by any demonstration of watchfulness, fleeing from dogs, and not readily exposing itself within range of shot. It defends itself, however, with great vigor, when compelled to do so. It is not easily trapped, being extremely cautious, and appearing to understand the nature and purpose of a trap almost as well as those by whom it is set. Wolves have often been known even to approach a trap so skillfully as to devour the bait without harm to themselves, getting at it from below.

Diversities appear in the wolves of different countries of Europe and Asia, but not very considerable. The French wolves are generally browner, and rather smaller, than those of Germany; the wolves of Russia are larger, and have longer hair; the wolves of the Alps are brownish-gray, and not of large size; in Italy and Turkey a tawny color predominates. In some very northern regions, wolves become white in winter; and white wolves, probably albinos, sometimes occur in more southern regions. The black wolf is the most marked European variety. It is found in the Pyrenees and in Spain, and is very large and strong. Strings of mules are often followed by these wolves in the passes of the Pyrenees, after evening comes on, and they not unfrequently succeed, notwithstanding all the care of the muleteers, in capturing some of the animals.

Wolves are still very plentiful in some parts of Europe. In the Pyrenees and Ardennes, among the Carpathian mountains, in Turkey and the principalities, they are common; and in the vast forests of Poland and Russia wolves often appear in formidable packs, and still cause much loss by their attacks on cattle, sheep, and horses. As culture increases, wolves become scarce. The wolf was formerly common in Britain, and the Anglo-Saxon name for January, *wolf-month*, is significant of this fact. Places of refuge from wolves were erected for travelers in wild and unpeopled districts, as at Flixton in Yorkshire. King Edgar commuted the punishment of criminals on their producing a certain number of wolves' tongues. Lands in Derbyshire were held on condition of killing wolves. It is not easy to say at what date wolves ceased to exist in England; it was probably about the end of the 15th c., but they continued to commit serious ravages on flocks, in Scotland, in the end of the 16th c., and the last wolf in Scotland is said to have been killed in 1743. They existed in Ireland at least as late as 1770. See Hastings's *British Animals*.

The American wolves are very similar to those of the old world. They have been described as forming several distinct species, but are by some included in one, doubtfully distinguished from the common wolf, and to which the name *canis occidentalis* is given. The fur is thicker, and the form more robust than in the common wolf, the muzzle is less pointed, and the profile not so straight, the legs and ears are shorter, and the tail is more bushy. The GRAY WOLF (*canis occidentalis*, var. *griseo-albus*, or *C. griseus*) is abundant in the northern parts of North America, except in the long-settled districts, from which it has been expelled by man. It is the only kind found in Canada. A few still remain in the mountainous and wooded parts of New England. Packs of wolves hang around the herds of buffaloes (bisons) on the western prairies, not daring to attack strong animals, but ready to seize any sickly straggler that falls behind the rest. They hunt and run down deer. The gray wolf equals the European species in cunning, and has been known to bite off the cord close to the trigger of a set gun, and afterward to devour in safety the bait placed before the muzzle. It has also been known to haul up fishing-lines set in a hole of the ice, and to help itself to the fish. It is frequently taken by means of pit-falls. On the prairies, the Indians kill great numbers of wolves by inclosing them in a circle gradually reduced, but originally extending over many miles. A premium of 10 to 20 dollars a head was formerly paid, in some parts of America, for the destruction of wolves, partly by the state, and partly by the county or

town, because of their ravages among sheep. The range of the gray wolf extends to the coldest northern regions, as Melville island and Banks's Land. In the north-western states, the gray wolf gives place to the DUSKY WOLF (*canis nubilus* of many naturalists); and in the s. is the BLACK WOLF (*C. ater* or *lycaon*); while on the upper parts of the Missouri, the WHITE WOLF appears, and the RUFOUS WOLF in Texas. They differ little in characters and habits from the gray wolf.—The PRAIRIE WOLF (*C. latrans* or *lyciscus latrans*), the COYOTE of the Mexicans, is a very different animal, more resembling the jackal. It is found from Mexico northward to the Saskatchewan, abounding on the vast plains of the Missouri. It is 36 to 40 in. long, with a tail of 16 or 18 in., the muzzle sharp and fox-like, the ears very large and erect, four toes on each foot, and on the fore-feet a sharp claw on the inside, 2 in. above the ground, attached to the rudimentary thumb; the color is usually dull yellowish gray, with black cloudings, the under parts dirty white. It hunts in packs. It is an extremely fleet quadruped, excelling every other in the countries which it inhabits, except the prong-horn. Its voice is a kind of snapping bark. The true wolves never bark, the only sound they emit being a prolonged and dismal howl. See illus., WHALE, ETC., vol. XV.

South America has numerous species of *canidæ*, some of which are known as Aguana wolves, and are nearly allied to the prairie wolf.

WOLF, FREDERICK A., the most gifted classical scholar and first critic of his age, was born Feb. 15, 1759, at Haynrode, near Nordhausen. He was brought up and educated with great strictness by his father, the leader of the choir and organist of the place; but was afterward sent to the gymnasium at Nordhausen. Here, under the training of the rector Hake, were developed in him not only that restless ardor for the thorough study of the ancient languages which actuated him throughout life, but also, what was afterward the predominating trait of his character, the habit of inquiring and judging for himself, and of pursuing only one object at a time. Before leaving the gymnasium for the university, he had read the principal ancient authors, as well as the French, Italian, Spanish, and English; and had also perfected himself in the theory and practice of music. At the university of Göttingen, which he went to in 1777, with the intention of studying philology exclusively, he attended the lectures very irregularly, being already much given to private study. For the rest, he lived very retired, was little visited or known, and was only intimate with a few. However, he gave lessons to several students in Greek and also in English, for which he published Shakespeare's *Macbeth*, with explanatory notes (Gött. 1778). From Heyne (q.v.), who had once excluded him from hearing a course of lectures on Pindar, on account of the irregularity above noticed, he kept himself quite aloof. In order, however, to commend himself to a man who had so much influence as Heyne had, he laid before him, shortly before his departure in 1779, a dissertation, containing some novel views regarding the Homeric poems; which, however, Heyne coldly returned. In the same year, he went as teacher to the pædagogium at Ilfeld, and there first established his fame by an edition of the *Symposium* of Plato, with notes and introduction in German. In 1782, he was appointed to the rectorship of the high school at Osterode, in the Harz; and, in 1783, accepted an invitation to Halle, as professor of philosophy and of pedagogical science. In Halle, Wolf had at first difficulties to encounter, as he rather estranged than attracted students by the high tone of his teaching. However, he soon learned to adapt himself to his audience, and then the crowd of eager pupils was very great. As academical teacher, he went on the principle that classical antiquity should be looked upon chiefly as serving for a model of what is noblest and greatest in public and private life, and as such, is to be employed as a medium of education. He made it the principal duty of his office to provide able teachers and superintendents for the schools of his native country, and to deliver education, as much as possible, from the scientific pedantry of the old school of pedagogues. Literary labors and fame he looked upon more as a subordinate object; and his effectiveness as a teacher was unparalleled during the twenty-three years he lived at Halle. He nevertheless established his reputation as a scholar and critic by an edition of Demosthenes's *Oratio adversus Leptinem* (1789), which attracted much attention, and still more by his celebrated *Prolegomena in Homerum* (1795), in which he unfolded, with prodigious learning and acuteness, his bold theory, that the *Odyssey* and *Iliad* are composed of numerous ballads or rhapsodies by different minstrels, strung together in a kind of unity by subsequent editors (see HOMER). This work made a great sensation through the whole of Europe. Some scholars gave out that they had long entertained similar notions regarding the Homeric poems; and Heyne insinuated that the Prolegomena were only a reproduction of what Wolf had heard at Göttingen. This gave rise to the spirited *Briefe an Heyne* (Letters to Heyne, Berl., 1797), of which the first three may be considered as models of scholarly polemic and fine irony. Some years afterward Wolf published the text of the four orations of Cicero, whose genuineness had been called in question by Markland in England, namely—*Post reditum in Senatu, Ad Quirites post reditum, Pro domo sua ad pontifices, De haruspicum responsis*—appending the previous controversy, and adding striking observations of his own in proof of their spuriousness. He next went still further, and attacked the authenticity of the oration *Pro Marcello*, which had long been studied by the Ciceronians as a model of eloquence and style, pronouncing it to be mere inflated declamation, in a diction hardly Latin, and which Cicero

never could have written. This audacious skepticism produced no little alarm. After having refused a call in 1796 to Leyden, in 1798 to Copenhagen, and 1805 to Munich, his position was considerably improved, and he received the title of privy-councilor. After the disasters of 1806, the university at Halle was dispersed, and Wolf was for a time reduced to great straits. However, he soon found a suitable position as member of the academy of sciences at Berlin, where he took an active part in the re-organization of the university, and became a professor. He was taken into the ministry of the interior as a member of the section for public instruction; but, finding that the duties interfered with his time and strength for teaching, which he considered his mission, he continued only a short time in public office. He next gave up the work of an ordinary professor, and reserved at last only the privilege of lecturing in the university on such subjects as he chose. For the benefit of his health, he took a journey to the s. of France in April, 1824, and died at Marseilles, Aug. 8, 1824. The multitudinous works of Wolf we cannot attempt to enumerate. They consist chiefly of critical editions of classical writings, with dissertations and annotations, and often with admirable translations either in German or Latin. While in Berlin he edited, along with Buttmann, the *Museum der Alterthumswissenschaften* (1807–10), and afterward the *Literarische Analecten* (1817–20), which has been pronounced perhaps the best philological journal that has ever been published, and which contains, among other papers by Wolf, a long notice of Richard Bentley. From the papers which he left, his son-in-law, Körte, published *Ideen über Erziehung, Schule und Universität* (Ideas on Education, School, and University; Quedlinb., 1835).—See Hanhart, *Erinnerungen an Fr. Aug. W.* (Bas. 1825); Körte, *Leben und studien Fr. Aug. W.'s des Philotogen* (2 vols., Essen., 1835); Gottholdt, *Fr. Aug. W. die Philologen und die Gymnasien* (Königsb., 1843).

WOLF, Johann Christian von, a celebrated philosopher and mathematician, was b. in 1679, at Breslau. His father, a rather poor but well-informed artisan, made it his chief object to give a good education to his son, who at an early age showed excellent abilities. Wolf received the elements of his education at the gymnasium of Breslau, and went to Jena in 1699 to study theology. However, mathematics and philosophy were his favorite sciences, and to them he almost exclusively devoted himself. In particular, he studied Descartes and Tschirnhausen's writings, to whose *Medicina mentis* he wrote annotations, which brought him into connection with Leibnitz. In 1703 he delivered at Leipsic a graduation disputation, *De Philosophia Practica Universali, Methodo Mathematica Conscripta*, which made a very favorable impression, and then began to give lectures in mathematics and philosophy, which were very numerously attended. By various works which he published on special branches of mathematics, his name became celebrated even in foreign countries. When the incursion of Charles XII. into Saxony obliged him to leave Leipsic, he received, on the recommendation of Leibnitz, a call to Halle, as professor of mathematics and natural philosophy. He there acquired great celebrity by his systematical method of teaching, as well as by numerous mathematical writings. The clearness and definiteness of the ideas and propositions which he exhibited in his mathematical lectures, were something till then quite unknown. Hence it came that his system of metaphysical and moral philosophy, which he worked out according to this mathematical method, and published, met with universal approbation, and quickly spread through Germany: it became a kind of rage to treat all sorts of subjects in the mathematical method, the effect of which was often ludicrously pedantic. Wolf, however, was violently attacked by his colleagues in Halle, especially by those theologians who favored the pietism then coming into vogue: he was declared to be a despiser of religion, and a teacher of error; and a formal accusation was brought against him to the government. The immediate ground of the accusation was his oration *De Philosophia Sinensium Morali*, in which he spoke with approval of the morality of Confucius, besides which the basest insinuations were brought against him, derived from his doctrine of freedom, which, it was said, encouraged social anarchy. By a cabinet order of Frederick William I., of date Nov. 15, 1723, Wolf was deposed from his office, and was commanded, under pain of death, to quit Halle in 24 hours, and the Prussian dominions in two days. He did so on Nov. 23, and met with a favorable reception in Cassel, and was appointed to a chair in the university of Marburg. The dispute about his philosophical system now became general, and nearly the whole of Germany took part either for or against him. At the same time he received from abroad many marks of honor and advantageous proposals, which last, however, he declined. In the mean time, the Prussian government had begun to regret the steps it had been led to take against him, and had appointed a commission to re-examine the matter. This resulted in his entire justification; and when Frederick II., who had a great esteem for him, and had studied his system, ascended the throne (1740), Wolf was induced to return to Halle as professor of the law of nature and nations, and with the titles of privy-councilor and vice-chancellor. In 1743 he became chancellor in the place of Ludwig, and was raised to the rank of baron of the empire by the elector of Bavaria during the regency. Wolf died in 1754. Before his death he saw his philosophy spread over the whole of Germany and a great part of Europe; he had, however, outlived his reputation as an academical teacher. That he did great service to philosophy, cannot be denied. If he did not enrich it by great and brilliant dis-

coveries, he at least directed attention to systematic method; and by treating scientific subjects in the mother tongue, he did much to create that wide-spread taste for philosophical speculation which has since been characteristic of Germany. Wolf adopted Leibnitz's hypotheses and principles, which he endeavored to carry out into a complete system and popularize. But although the Wolfian philosophy was a great improvement on the scholastic Aristotelianism that had previously prevailed, its dogmatism could not stand the criticism of Kant, and it is now a theory of the past. By his voluminous writings, partly in the German language, and the immense number of his pupils, Wolf had a wide and beneficial influence on his age, more especially as counteracting pietism and mysticism, then rampant. He also did good service to the German language. The multitude and extent of his writings is truly marvelous, even if we look at nothing else than the mechanical labor of writing them. He treated mathematics and philosophy in a double set of works; the one in full in Latin, the other shorter as German school-books, of the most of which several editions have been published. Besides these, are a great number of treatises on single subjects in physics, mathematics and philosophy. His systematic works on all the chief branches of philosophy alone amount to 22 vols. in quarto.—See *Christian Wolf's eigene Lebensbeschreibung* (Christian Wolf's Autobiography), published by Wuttke (Leip., 1841); Ludovici, *Sammlung und Auszüge der Sämmtlichen Streitschriften wegen der Wolf'schen Philosophie, u. s. w.* (Collection and Extracts of the Controversies about the Wolfian Philosophy, etc., 2 vols., Leip., 1737); by the same author, *Ausführlicher Entwurf einer vollständigen Historie der Wolf'schen Philosophie* (3 vols., Leip., 1737).

WOLF-DOG, a kind of dog used for hunting the wolf, formerly abundant in Norway and Sweden, but now almost exclusively found in Spain, into which it is supposed to have been introduced by the Goths. It is of the same group with the shepherd's dog; and is of a large size, little inferior to the mastiff, with pointed nose, erect ears, long silky hair, and a very bushy tail curled over the back. In color it is mostly white, with large clouds of tawny color or brown.

WOLFE, a co. in e. Kentucky, drained by the Kentucky and Red rivers; 190 sq.m.; pop. '90, 7180. Co. seat, Campton.

WOLFE, a co. in s.w. Quebec, dominion of Canada, drained by St. Francis river and other streams; 266 sq.m.; pop. '91, 15,018. Co. seat, Dudswell.

WOLFE, The Rev. Charles, the son of a county gentleman of Kildare, was b. Dec. 14, 1791, at Dublin. The family having come to England on the death of his father, which took place while he was yet quite young, the boy received his chief education at Winchester, where he showed himself an apt scholar. Being transferred in 1809 to the university of Dublin, he succeeded in securing a scholarship, and in 1814 his degree of bachelor of arts. During this period he was actively employed as a tutor: at this time it was also that he composed the greater part of the poetry which he left as his legacy to the world. In 1817 his celebrated lines on *The Burial of Sir John Moore* suggested by reading Southey's impressive account of it in the *Edinburgh Annual Register*, were written; and soon after they found their way into the newspapers. So generally admired were they that even while the name of their author remained unknown, they had won for themselves a secure place in the memory of the British people. As a singularly felicitous and touching poetical record of a noble and pathetic incident in our national history, they are, perhaps, not likely to be forgotten while that history is patriotically read and remembered. Wolfe, after qualifying himself to take orders, became, in 1817, curate of Ballyclog, in the county of Tyrone, from which he was shortly transferred to the larger parish of Donoughmore. His devotion to his duties was extreme, and was repaid by the warm affection of all with whom they brought him in contact. But they seem somewhat to have overtaxed the strength of a constitution at no time robust; symptoms of consumption appeared; and a visit which he made to Edinburgh in May, 1821, developed it. He tried in search of health, successively, England, the s. of France, and finally the sheltered Cove of Cork, in which last place he died on Feb. 21, 1823.

His literary *Remains*, consisting of sermons chiefly and poems, were given to the world, with a Memoir, in 1825, by the Rev. John A. Russell, M.A., archdeacon of Clogher, an attached friend of the deceased. The work, though containing some poetry of real merit, never made any great impression, and is now quite forgotten. The one beautiful piece which preserves for us the name of Wolfe, was attributed by guess, while he lived, to more than one of the most famous writers of the day—as, notably, Campbell and Byron. Since his death, several nefarious attempts have been made to filch from him the fame he continues to derive from it.

WOLFE, James, the most famous English gen. of his time, was b. at Westerham, in Kent, on Jan. 2, 1727. His father was a Lieut.col., afterwards Gen. Wolfe, an officer of merit and distinction, who served under Marlborough and prince Eugene. Along with his brother Edward, who was about a year younger, James received his first education at a small school in that neighborhood. From the first, the boy had resolved to follow his father's profession of arms; and when little more than 13 years old, he started to accompany the col. as a volunteer in the unfortunate Carthagena expedition. An attack of illness, however, made it necessary to put him ashore at Portsmouth just before

the fleet sailed. In 1742 he received his commission as ensign in the 12th, or col. Duroure's regiment of foot, with which he was soon after embarked for service in Flanders. In the year following he took part in the famous battle of Dettingen; and it is evidence of the capacity he already began to display, that we find him, though still the merest boy, acting in the responsible capacity of ajt. of his regiment. After the battle of Fontenoy in 1745—at which Wolfe, who had now become a capt. in the 4th, or Barrell's regiment of foot, was, notwithstanding a current tradition to that effect, certainly not present—the British troops were withdrawn from Flanders to assist in the suppression of the rebellion at home. With the army in Scotland he served in the capacity of brigade-maj., and was present at the battles of Falkirk and Culloden. In 1747 he was again abroad on service. At the battle of Laufeldt he was wounded, though not seriously; and his conduct was so distinguished that he was publicly thanked by his commander-in-chief, the duke of Cumberland. In the beginning of the year 1749 he was appointed maj. of the 20th foot, then stationed at Stirling, whither he proceeded. In the absence of the col., the command of the regiment devolved upon him. In this responsible position, which was rendered much more trying by the disaffection still prevalent, young as he was, Wolfe conducted himself with admirable tact and discretion. With little interruption, he remained in Scotland till the end of 1753, when the regiment returned to England. From the tone of his correspondence, it is evident he was not greatly delighted with Scotland or its inhabitants. In the mismanaged expedition against Rochefort in 1757, Wolfe was appointed to act as quartermaster-gen. of the force. The total failure of the operations brought disgrace to nearly all concerned; but it became sufficiently known that, had Wolfe's prompt and daring counsels been followed, the result would have almost certainly been different; and his reputation, already a brilliant one, rose considerably in consequence. In particular, it appears that the attention of Pitt was now first decisively drawn to him as an officer of whom, in any enterprise intrusted to him, great things might be expected. As marking approval of his conduct, the full rank of col. was conferred on him. The high opinion thus formed of him, was signally confirmed the year following, when he was intrusted with the command of a brigade in the expedition against cape Breton, under Gen. Amherst. A great success was obtained in the capture of Louisburg; that it was mainly due to Wolfe's skill, boldness, and activity was quite clearly understood, and he became popularly known as "the hero of Louisburg." Presently came the opportunity which was to consummate his glory, in the instant of heroic death. Pitt was now organizing his grand scheme for the expulsion of the French from Canada; it was his just boast that he "sought for merit wherever it was to be found;" and the expedition, which had for its object the capture of Quebec, the enemy's capital, he confided to the care of Wolfe, allowing him, as far as possible, a *carte blanche* for the choice of his subordinate officers. On Feb. 17, 1759, Wolfe, advanced to the rank of maj.gen., and commanding an army of between 8,000 and 9,000 men, set sail from England. At Louisburg he had news of the death of his father, the state of whose health had for some time been such as to prepare him for the event. On June 26 Wolfe landed his forces on the isle of Orleans, opposite Quebec, and proceeded to concert his plans for the attack upon it. This, of which he had shortly before written as likely to be found "a very *nice* operation," proved, on a closer examination, to be one of stupendous, and, indeed, nearly hopeless difficulty. The system of defense adopted by his adversary, the skillful and wary Montcalm, was such as to offer him no point of advantage. In all his attempts, though seconded most ably by Admiral Saunders, who commanded the fleet, he found himself completely foiled. The season wore fast away during which operations could be continued; and an abortive result seemed imminent of the expedition from which so much had been hoped. But at last, at day-dawn of Sept. 13, he found himself at the head of his little army on the Heights of Abraham, above the city, where Montcalm, sorely against his will, was forced to risk decision of the struggle by battle in the open field. Resolving to stake all on a final effort, Wolfe had, during the night, succeeded in scaling the cliffs at a point insufficiently guarded—an operation of such frightful risk and difficulty as in war has scarcely a parallel. Of victory he had no doubt; his little force now—exclusive of detachments necessarily left behind—reduced to something like 5,000 men, was indeed opposed to near 8,000 of the enemy, besides Indian auxiliaries; but of these it was well known that only a part could be depended on as trained and veteran troops. The result justified his confidence; after a short struggle, the enemy was driven from the field in complete rout; the capitulation of Quebec followed some days after; and its fall decided the fate of Canada. But Wolfe did not live to reap the fruits of his victory; he died in its very hour. In person he led the right; twice wounded, he refused to leave the front; a third bullet prostrated him; and he was carried, plainly dying, to the rear. He lived only long enough to know that the battle was decisively won; then, rallying his last strength to give one final order, and saying: "Now God be praised! I die in peace," he expired. The gallant Montcalm also fell, paying, with almost his last breath, the tribute of a true soldier to the valor of the troops who had beaten him: "Since," said he, "it is my misfortune to be discomfited and mortally wounded, it is a *great consolation* to me to have been vanquished by so brave an enemy. If I could survive, I would engage to beat three times the number of such forces as mine were, with a third of British troops."

The news of the victory was received in England with a tumult of exultation, dashed with grief for the loss of the hero to whom the nation owed it. When parliament met in November, the house of commons addressed the king, praying that his majesty would order a monument to be erected to the memory of the dead soldier in Westminster Abbey; where, accordingly, an *effigies* of him may be seen, with allegorical adjuncts as tasteless and absurd as usual. He was buried beside his father, in the family vault under the parish church at Greenwich.

A single military achievement, however brilliant, cannot be made ground of a claim for the successful soldier to take rank as a great capt. But that Wolfe had the true genius for command, which needed only time and further opportunity to win for him a fame still more splendid, it is scarcely permitted us to doubt. Through the lower regimental grades he rose rapidly by sheer force of personal merit, at a time when the service was a mere hotbed of corruption; and on attaining to higher commands, he in every instance gave evidence of the higher military qualities which proved him eminently worthy of them. He had only reached the age of 33. when in his last, and properly his one great achievement, he died, seemingly cut off in the mere opening of a brilliant career. He was of warm affections, and frank and generous nature; though his temper was somewhat eager, impulsive, and irascible, few men have ever been more generally beloved; and not many men so famous have left behind them a memory in every way so pure and spotless.

Till lately, no memoir of him in the least adequate existed; but in *The Life of Major-general James Wolfe—founded on Original Documents, and illustrated by his Correspondence,* by Robert Wright (Lond. Chapman and Hall, 1864), the want is now competently supplied.

WOLF'ENBÜTTEL, a very old t. of Brunswick, Germany, a low marshy district on both banks of the Oker, 7 m. s. of Brunswick by railway. Its old fortifications have been converted into promenades. There are several churches, schools, charities, and a college. In a handsome building formed after the model of the pantheon at Rome, is the famous library placed here in 1644, of which Lessing was sometime librarian. It consists of nearly 300,000 volumes, and upward of 10,000 manuscripts, and contains some of the finest missals in Europe, an immense collection of bibles, including Luther's bible with autograph notes. In the same institution are preserved the great reformer's marriage-ring, spoon, drinking-glass, and portrait by Cranach. The cultivation of vegetables is carried on to a great extent, and there are manufactures of lacquered and japanned wares, paperhangings, leather, tobacco, and liqueurs; a trade in corn, cattle, and linen-yarn. Pop. '90, 14,484.

WOLFENBÜTTEL FRAGMENTS. See LESSING; REIMARUS.

WOLFF, ALBERT, b. Germany, 1814; studied sculpture there and in Italy. He was appointed professor in the Berlin academy of fine arts in 1866. Among his works, which are noted for their severe taste, are the statues of Frederick William III. at Berlin, and of Galileo at the university of Pesth. He died 1892.

WOLFF, EMIL, b. Berlin, 1802; studied sculpture with his uncle Schadow, and at Rome. He was some time prof. in the Berlin academy of fine arts. His *genre* statues and those on mythological or classical subjects are among his best works. Among his best busts are those of Bunsen, and of Thorwaldsen. He d. 1879.

WOLFF, JOSEPH, D.D., LL.D., 1795–1862; b. Weilersbach, Germany; was the son of a rabbi; early became a Christian; taught Hebrew at Frankfort; studied at Munich, Weimar, and Vienna; became a Roman Catholic at Rome, 1815, but was expelled for heresy, 1817; went to England, united with the church of England; studied two years at Cambridge, embarked as missionary to the Jews, 1821; traveled in the east; returned to England, 1826, by way of the Crimea and Circassia; married a daughter of the earl of Oxford, 1827; embarked on another missionary tour, leaving his wife in Malta; was taken prisoner and sold as a slave, but escaped to Bokhara, laboring 3 months there among the Jews; started for India, passing through Afghanistan and Cashmere, reaching Calcutta, 1833; visited the Jews at Cochin and Goa; spent some time in Abyssinia; returned to England *via* Malta, 1834; visited Abyssinia again, 1836, and the Rechabites of Yemen; sailed from Bombay for New York, 1837; preached in the principal cities of the United States; returned to England, 1838; was curate at Smithwaite; went in 1843 to Bokhara to effect the release from imprisonment of Col. Stoddart and Capt. Conolly; was himself made a prisoner and condemned to death, but escaped through the interference of the Persian ambassador; reached England, 1845. He published *Journal of Missionary Labors; Mission to Bokhara.*

WOLFF, WILHELM, b. Brandenburg, 1816. He is a sculptor of merit, his best work being representations of animal life. Among his best known works are "The Lion's Ride," a buffalo fighting with wolf dogs, and a bacchante sporting with a panther. Wolff has also produced busts of Joachim II., Herder, and Bach. He died 1887.

WOLFF'IAN BODIES, important organs in the vertebrate embryo, in which they serve a temporary purpose, except in the lowest class (fishes, amphibia), where they remain permanently. In the development of the chick, these bodies may be seen as early as the fourth day, lying along either side of the vertebral canal, from the region of the heart

downward and backward, and consisting of a series of cæcal or blind appendages, corresponding with the so-called kidneys of fishes, which in reality are true persistent Wolffian bodies. On the fifth day, the appendages become convoluted, and the body which they collectively form increases in mass. The appendages are then seen to possess a secreting property, and the fluid which they secrete is conveyed by the duct of each side into the *allantois*, a sac which, at the same time, acts as a temporary respiratory organ, and is also used as a urinary bladder. Hence these organs may be regarded in the light of temporary kidneys. In the chick, the true kidneys begin to form from the Wolffian bodies at the fifth or sixth day, and gradually increase in size as the temporary organs diminish; and at the end of fetal life, only a shrunken rudiment of them can be observed. In man, the process is very similar, the Wolffian bodies beginning to appear toward the end of the first month; while in the seventh week, the true kidneys first present themselves. From the beginning of the third month, the Wolffian bodies begin to decrease, the kidneys increasing in a corresponding ratio, and at the time of birth, scarcely any traces of the former can be seen. It was formerly believed that the essential parts of the generative apparatus—the testes in the male and the ovaria in the female—were also developed from these bodies; but this is not the case, as they have an independent origin in a special mass of blastema peculiar to themselves, in the immediate vicinity of the Wolffian bodies.

WOLFFIAN BOTTLES, the name given to a set of apparatus employed for the distillation of hydrochloric acid (q.v). It consists of a retort, in which chloride of sodium (common salt) is submitted to the action of sulphuric acid, gradually added through a funnel and the vapor evolved passes out into the first bottle and is absorbed by water. This process continues till the power of absorption of the water in the first bottle ceases (or, in other words, till the water becomes *saturated*), when the vapor collects in the neck of the retort and in the tube leading to the first bottle, till it acquires sufficient tension to force its way through the water, and enter the second bottle by a tube. In turn, the water in the second bottle becomes saturated, after which the gas is forced to find its way into the third bottle through the other two by means of the connecting tube. After the force of reaction in the retort has become weakened, the evolution of the gas is quickened by the application of a flame, which requires to be gradually increased. Considerable heat being generated during absorption, it is desirable that the bottles should be immersed in cold water. A third tube entering each bottle, except the last, admits atmospheric air to prevent the rarefaction in the retort tending to force the contents of the bottles back into it.

WOLF-FISH, *Anarrhichas*, a genus of fishes of the family *blenniidæ* (see BLENNY), having no ventral fins, the pectorals very large, a single dorsal fin extending from behind the head almost to the tail-fin, a long anal fin, the tail-fin rounded; the head round, smooth, and blunt; the teeth large and strong, not attached immediately to the jaws; but to bony processes connected with them by sutures. The jaws are powerful, the front teeth resemble the canine teeth of mammals, while the vomer and palate are furnished with teeth which have the form of rounded tubercles. One species, the COMMON WOLF-FISH, also CAT-FISH and SEA-CAT (*A. lupus*), is found on the coasts of Britain, and is plentiful in more northern seas. It is frequent on the coasts of Scotland, particularly in the n., but is more rare on the English coasts. It is of a light gray color, brownish on the back; the lower parts exhibiting ten or twelve dark transverse stripes. The skin is covered with much slime. It attains the length of 6 ft., and is a creature of formidable and even repulsive appearance: it bites savagely when caught, and fishermen therefore generally dispatch it as soon as possible by knocking it on the head. It preys chiefly on mollusks and crustaceans, which its jaws easily crush. It is often very destructive to nets, being an active and powerful fish. Notwithstanding its ugliness, it is in esteem for the table, and it is often found in the Edinburgh market. It is much used in Iceland, both fresh and salted; and a kind of shagreen, used for bags and pouches, is made of its thick skin. A very similar species, *A. vomerinus*, is found on the American coast from New York to Greenland, and is not only used fresh, but also split, salted, and smoked.

WOLF'RAM is a native compound of tungstate of iron and manganese, from which the metal tungsten (q.v.) is usually obtained.

WOLF'S-BANE. See ACONITE.

WOL'GAST, a commercial t. and sea-port of Prussia, in Pomerania, stands on the Peene, about 10 m. from its entrance into the Baltic, and 53 m. s.w. of Stettin. The shallowness of the water admits only the smaller class of sea-going vessels entering the harbor. There is a public dockyard and a school of navigation; and the inhabitants, who numbered (1890) 7880, are occupied in shipbuilding, seafaring, and in the manufacture of candles, soap, and tobacco. The larger ships discharge and take in cargoes at Ruden, a small island and pilot-station opposite the mouth of the Peene, known as the landing-place of Gustavus Adolphus in 1630. Wolgast is a very old town; it was strongly fortified as early as the 12th c., and was once the residence of the dukes of Pommern-Wolgast; it was taken and retaken five times between 1628 and 1675; the Russians plundered and burned it in 1713, and the Swedes retook it in 1715.

WOLLASTON, William Hyde, M.D., a distinguished physicist, was the second son of the Rev. Francis Wollaston, of Chiselhurst, in Kent, and was born Aug. 6, 1766. After the usual preliminary education, he was entered of Caius college, Cambridge, where he studied for the medical profession, and took the degree of M.D. in 1793, in which year, also, he was elected a fellow of the royal society. After practicing as a physician at Bury St. Edmunds, he removed to London; but being beaten by Dr. Pemberton in a competition for the post of physician to St. George's hospital, he determined thenceforth never to write a prescription, "were it for his own father," but to devote himself wholly to scientific investigation. This sudden resolution proved ultimately most beneficial, leading him rapidly to wealth and fame; for unlike many eminent investigators of nature's laws and phenomena, Wollaston combined "the genius of the philosopher with the skill of the artist," and succeeded in making industrial application of several of his important discoveries. His researches were prosecuted over a wide field, but were pre-eminently fruitful in the sciences of chemistry and optics. To the facts of the former science he added the discovery of new compounds connected with the production of gouty and urinary concretions, such as phosphate of lime, ammoniomagnesian phosphate (a mixture of these two forming the "fusible" calculus), oxalate of lime, and cystic oxide; also the discovery in the ore of platinum of two new metals, palladium (1804) and rhodium (1805). By his ingenious discovery of a mode for making platinum malleable, he is said to have gained £30,000, and his mode of hardening steel, and some other discoveries of a practically useful nature, were also very lucrative. His contributions to optics were the celebrated "goniometer" (q.v.), a most valuable gift to mineralogists; an apparatus for ascertaining the refractive power of solid bodies; the "camera lucida" (q.v.); the discovery of invisible rays outside the violet band of the spectrum; and an immensity of valuable and interesting observations on single and double refraction. He died Dec. 22, 1828.

WOLSELEY, Sir Garnet Joseph, first Viscount; b. near Dublin, in 1833. He entered the army in 1852, and since then has been constantly engaged in the service of his country, and has steadily risen to greater eminence in his profession. He served in the Burmese war of 1852–3; he was severely wounded in the Crimea, and received the cross of the legion of honor for his bravery there. He was in India during the mutiny, and in the Chinese war of 1860. Next year he went to Canada, and in 1870 successfully managed the Red river difficulty. On the outbreak of the Ashantee war, Wolseley, now knight commander of the Order of Saints Michael and George, was appointed to the command; and on his return received the thanks of parliament and a grant of £25,000 for the "courage, energy, and perseverance" he had displayed in the conduct of the expedition. In 1875, become a maj.gen, he was dispatched to Natal to superintend the affairs of the colony; in 1876 was nominated a member of the Indian council. In 1878 he was made high commissioner and commander-in-chief in Cyprus, from which post he was recalled in 1879 in order to proceed to the seat of the Zulu war, with supreme civil and military command in Natal, the Transvaal, and adjacent disturbed territories. He arrived just before the power of the Zulu king was broken at Ulundi, and arranged the terms of peace with the Zulu chiefs. He organized, in 1879, the government in Zululand, and conducted a campaign against the Secocoeni. Upon his return to England, in 1880, he was made quartermaster gen.; and in 1882, became adj. gen. He was placed in command of the English forces sent against Arabi Pasha in rebellion. At the battle of Tel-el-Kebir, Arabi's army was completely overthrown by Gen. Wolseley, and the insurrection brought to an end. For his success in this campaign he was raised to the peerage. After Gordon had been surrounded at Khartoum, during the Soudan rebellion, Lord Wolseley was sent up the Nile with an expedition for his relief. He failed in this object, and remained in command of the forces in Egypt. He is the author of a number of essays and military handbooks.

WOLLSTONECRAFT, Mary. See Godwin, William.

WOLSEY, Thomas, cardinal, was born in 1471 at Ipswich, in the county of Suffolk, and is reputed to have been the son of a butcher of that place. Though thus of humble origin, it is certain that by some means a good education was secured him, and at an unusually early age, he was sent to Magdalen college, Oxford, of which he became a fellow. It is said that while at Oxford, he was brought into somewhat intimate relations with the great Erasmus, unquestionably then in England. He afterward acted as tutor to the sons of the marquis of Dorset, through whose favor he became in 1500, rector of Lymington, in Somersetshire. On one occasion he appears to have got himself into difficulties. At a fair in the neighborhood, it was his misfortune one day, it is said, to be found drunk and disorderly; and by a certain knight of the shire, by name sir Amias Poulet, he was put in the stocks for the misdemeanor. That he figured in the stocks is certain; that he did so on the score of drunkenness there is no adequate evidence. When the power to retaliate came to him, he took his revenge on sir Amias by having him imprisoned for six years.

Wolsey, who was plainly one of the most insinuating of men in Somersetshire, became intimate with a Sir John Nafant, a man of considerable mark. Through the influence at court of this gentleman, he was appointed chaplain to Henry VII., with whom he speedily ingratiated himself. Being sent by the king on a special embassy to the continent, he acquitted himself so dexterously, that he rose still higher in favor; and in 1509 the deanery of Lincoln was conferred on him. The year after, Henry VIII. succeeded

to the throne left vacant by the death of his father. Nearly from this time forward, the life of Wolsey, previously noted, indeed, as a rising man, yet of no special public importance, is in effect the history of the England of which he implicitly became the ruler. From Henry he enjoyed the most unbounded favor and confidence; and the influence which he thus exerted in the conduct of affairs was such as has seldom been exerted by a subject. The most valuable ecclesiastical preferments were showered upon him; and finally, in the same year (1514), he obtained the bishopric of Lincoln and the archbishopric of York. The year following the dignity of cardinal was conferred on him by the pope, who, not long after, appointed him also legate. Besides these ecclesiastical honors, he was made by the king, in 1515, his prime-minister, and lord high-chancellor of England. From this time, up to that of his forfeiture of the royal favor, Wolsey was one of the most important men in Europe; and at home his power was almost without limit. The revenues derived from his various offices were of princely magnitude; and they were further enlarged by subsidies from foreign potentates, eager to conciliate his favor. He did not bear his honors meekly; in his way of life he affected a sumptuous magnificence, and a state only not royal, while in bearing he was arrogant and imperious. He openly aspired to be pope; and there seemed more than once ground for supposing that this crowning object of his ambition was really within his reach. He was, however, disappointed; and it has been surmised that his resentment against Charles V., to whom he attributed his failure, determined, to a considerable extent, the foreign policy of the country.

Such a man could not fail to have many enemies, eager, as occasion might offer, to discredit him with his royal master; and an occasion at length came, of which they did not fail to take advantage. To the project on which the king had set his heart, of divorcing Queen Catharine, and marrying Anne Boleyn, Wolsey showed himself hostile; of the latter part of the scheme he was known to disapprove; and his negotiations with a view to securing the consent of the pope to the divorce were conducted, as it seemed to the king, in a dilatory and half-hearted manner. Henry, where his passions were interested, could little brook contumacy of this kind; his displeasure was carefully fanned, and the disgrace of Wolsey was accomplished. In 1529 he was stripped of all his honors, and driven with ignominy from the court. Symptoms of relenting showed themselves, however, next year in the mind of the monarch, and it seemed as if Wolsey might again be taken into favor. The prospect, as it proved, was delusive. Being at the time in Yorkshire, the archbishopric having been restored to him, along with others of his minor preferments, he was arrested on a charge of high treason, and ordered to be conveyed to London for trial. On his journey he was attacked with dysentery, and at the monastery of Leicester, in Nov. 1530, he died.

The faults of Wolsey's character are obvious; but if his pride, ambition, and rapacity were inordinate, his luxury and ostentation somewhat unbeseeming a successor of the primitive apostles, he was not without redeeming qualities. Haughty and insolent to his enemies, and those whose claims ran counter to his own, to his dependents and inferiors he was generous, affable, and humane; and not a few of them showed their honorable sense of this by devotion to him in his misfortunes. Of learning he was a most liberal and enlightened patron; and the endowment of Christ Church college, Oxford, survives as a monument to attest this. He was plainly a man of large and splendid capacity; and he seems, on the whole to have been a diligent, faithful, conscientious, and salutary counselor and servant of the monarch who so long and entirely trusted to him. There are lives of Wolsey by Cavendish (1641), Galt (1812), Martin (1862), and Creighton (1888).

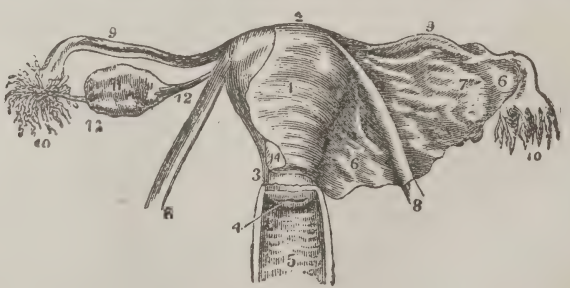
WOLVERHAMP'TON, a municipal and parliamentary borough of Staffordshire, is the most populous town of its county, and a center of iron manufactures and tin-plate goods, 13 m. n.w. of Birmingham. Of its numerous churches, that of St. Peter's, built in the 14th c. and recently restored, is a stately edifice, with a lofty embattled and pinnacled tower. The leading public schools are—a thriving grammar school, founded 1714, an orphan asylum, instituted 1850, for orphans from all parts of the kingdom, with 250 scholars, and a school of practical art, opened 1854. Among its philanthropic institutions, a general hospital and dispensary, opened 1849, and, like the orphan asylum, supported by voluntary contributions, is the chief. Wolverhampton sent members to parliament first in 1832, and became a municipal borough in 1847. It has quarter sessions of its own, a spacious cattle market, and a market hall. A commodious and handsome town hall has been erected; there is a system of deep sewerage; and its abundant water supply is in the hands of the corporation. There is a handsome bronze equestrian statue of prince Albert standing in Queen square. The town possesses an exchange where iron masters and merchants assemble; and an agricultural hall for the use of farmers and corn dealers. Wolverhampton stands upon the western edge of the extensive coal and iron-mining district of South Staffordshire, and is the metropolis of that district. On the s. and e. the vicinity is covered with coal-mines, iron-stone pits, blast-furnaces, forges, rolling-mills, and foundries; but on the n. and w. it is rural and picturesque. Its chief manufactures are tin-plate and japanned goods, enameled hollow wares, locks and keys, edge-tools, iron braziery and galvanized iron goods, gas and water tubes, cables and railway fastenings, iron-foundry goods, machinery, mills, cut nails, tips, cast hinges, electro-plate and papier-mâché goods, brass castings, and finished iron. Besides the establishments engaged in the hardware manufacture, there are several flour mills. Pop. '91, 82,620.

WOLVERINE. See GLUTTON.

WOLVERINE STATE. See STATES, POPULAR NAMES OF.

WOMAN'S NATIONAL CHRISTIAN TEMPERANCE UNION, THE, was organized in Cleveland, O., in 1874, by the state temperance unions, which were the outcome of the "temperance crusades" undertaken by women in 1873. Its first annual meeting was held in Cincinnati, Nov. 17–19, 1875. It now has unions and loyal legions in every state and territory, and in some foreign countries. It has departments of preventive, educational, evangelistic, social, and legal work; labors, in schools, prisons, etc.; among foreigners as well as Americans; in the interests of international arbitration; of Sabbath observance; aids in suppressing impure literature and art; prepares and presents petitions relating to reforms to judicial bodies. In 1896 there were about 11,000 unions and legions; membership of about 500,000, and a W. C. T. U. temple (cost $1,000,000) in Chicago. Leading newspaper, *The Union Signal.* Pres., Miss Frances E. Willard.

WOMB, THE, professionally known as the *uterus,* is a flattened, pear-shaped organ, whose position and various parts will be best understood by a reference to the fig. It consists of a body (1), a base or fundus (2), a neck or cervix (3), and a mouth or *os uteri* (4). It lies in the line of the axis of the outlet of the pelvis (q.v.), with base directed upward and forward, and the neck directed slightly backward. In the unimpregnated condition, which we are now considering, it is about three inches in length, two in breadth, and one in thickness, and weighs about an ounce and a half. On laying it open, or exploring its interior by the introduction of an instrument through the *os uteri,* its cavity is found to be very narrow, and to contain a little mucus. Its walls are nearly half an inch thick, and are mainly composed of muscle-cells and fibers running irregularly in all directions except round the *os,* where they make a partial sphincter. This muscular coat, which constitutes the bulk of the organ, is covered externally with a serous coat, derived from the peritoneum, and is lined internally by a mucous coat continuous with that of the canal called the *vagina,* by which the interior of the womb communicates with the outer surface of the body. This mucous coat abounds in small mucous follicles, and is provided with ciliated epithelium (q.v.). The neck or *cervix* of the womb is distinguished from the body by a well-marked constriction. The mouth, or *os,* projects slightly into the vagina (which is shown as laid open anteriorly in the figure). This opening is nearly round in the virgin, and transverse after parturition. It is of considerable size, and is named the *orificium uteri externum;* it leads into a narrow canal which terminates at the upper end of the *cervix* in a smaller opening, the *orificium internum,* beyond which is the shallow triangular cavity of the womb, of which it forms the lower angle, while the two upper angles, which are funnel shaped, constitute the beginning of the Fallopian tubes (q.v.), whose apertures are so small as only to admit the passage of a fine bristle. The blood-vessels and nerves enlarge in a very remarkable way during pregnancy, so as to adapt themselves to the increased wants of the organ, which, at the ninth month of utero-gestation, weighs from two to four pounds. The term *appendages to the uterus* is given to the Fallopian tubes and ovaries (q.v.) which are inclosed by the lateral folds of the peritoneum called the broad ligaments. The womb is suspended in the pelvic cavity in such a way as, by its mobility, to escape rude shocks from without or disturbance from the varying conditions of the surrounding viscera, while at the same time to allow of its vastly increasing in bulk with comparatively little discomfort when pregnancy occurs. This is effected by several duplicatures of peritoneum, containing variable quantities of fibrous and muscular tissue, and known



THE UTERUS AND ITS APPENDAGES VIEWED ON THEIR ANTERIOR ASPECT:

1, the body of the uterus; 2, its fundus; 3, its cervix; 4, the os uteri; 5, the vagina laid open; 6, the broad ligaments of the uterus on left side; 7, a convexity of the broad ligament caused by the ovary; 8, 8, the round ligaments; 9, 9, the Fallopian tubes; 10, 10, their fimbriated extremities; 11, the right ovary; 12, the utero-ovarian ligament; 13, the Fallopio-ovarian ligament, on which some small fimbriæ are continued for a short distance; 14, peritoneum of anterior surface of uterus. The membrane is removed on the right side to show the parts imbedded in its folds.—From Wilson's *Anatomist's Vade Mecum.*

from their form or connection as the *broad*, the *round*, the *utero-sacral*, and the *utero-vesical* ligaments.

The uterus is an organ peculiar to the mammalia, and in comparatively few of them (excepting the apes and cheiroptera) is it of the simple oval or triangular form which we have described. It is *two-horned* in the ruminantia, pachydermata, solipedia, and cetacea; and it is said to be *divided* where it has only a very short body, as in most of the carnivora and edentata, and some rodentia, which speedily divides both externally and internally, and is continuous with the oviducts or Fallopian tubes. The uterus is actually *double* in some of the edentata, and in most of the rodentia, including the mouse and hare; in which each Fallopian tube passes into an intestiniform uterus, which has two completely distinct openings lying near to each other within the vagina. In the marsupiata and monotremata, the modifications of this organ are still more singular.

It is impossible to do more than name the chief offices or functions of the womb. They may be divided into those which relate to (1) menstruation (q. v.), (2) insemination, (3) gestation, and (4) parturition.—For a complete account of the anatomy, physiology, and pathology of the uterus and its appendages, we must refer to a masterly article by Dr. Arthur Farre on that subject in the last volume of the *Cyclopædia of Anatomy and Physiology*.

WOMB, Diseases and Derangement of the. In this article we shall not include the ailments of the pregnant or of the puerperal state, some of which, as *phlegmasia dolens* and *puerperal fever*, have been noticed in special articles. Many of the diseases, however, which we shall have occasion to notice may be traced to pregnancy, miscarriage, or severe delivery, that had occurred months previously. A common result of inflammation that often succeeds miscarriage or a bad delivery is to check that process of involution by which the womb ought to be restored in a few weeks to the size and condition in which it existed previous to the occurrence of pregnancy. For a lucid description of the processes which act on the enlarged womb to restore it to its original state, we must refer to Dr. West *On Diseases of Women*, 2d ed. p. 90. How inflammation acts in interrupting these processes, is not easily explained; but after it has passed away, its effects may remain in the enlarged size and altered structure of the womb, changes which render it likely to suffer from the alternation of activity and repose to which the female generative system is liable. In this condition, the enlarged and heavy uterus is very likely to become prolapsed, or to become a seat of permanent congestion or chronic inflammation; and excessive menstruation and a feeling of weight in the pelvis are almost always present. Besides this form of enlargement, there is a far less common form in which the enlargement of the womb takes place independently of previous pregnancy, and is the result of true hypertrophy. The symptoms are, according to West, "a sense of weight in the pelvis, pain usually of a burning character, hemorrhages having gradually come on, and forced themselves by their slowly increasing severity on the patient's notice." The treatment is much the same in both these forms of enlargement—viz., the recumbent position on a hair or spring mattress, attention to the bowels, and local leeching every fortnight, to be continued for several months, together with the careful use of iron associated with small doses of iodide of potassium. Temporary separation from the husband's bed should also be insisted on. There is also a form of hypertrophy which is confined to the neck of the womb, which occasions great discomfort to the patient, and acts as a mechanical impediment to sexual union. In these cases, no relief can be afforded except by a surgical operation, which is described in West, *op. cit.* p. 77.

From these results of "simple errors of nutrition," leading to increased growth of the organ, we pass on to the debatable and much-trodden ground of *inflammation of the womb*. *Acute inflammation* of the unimpregnated womb may arise from unaccustomed and excessive sexual intercourse, sudden suppression of the menstrual discharge, the extension of gonorrhœal inflammation, etc.; but, as it is comparatively rare, and seldom dangerous to life, we shall at once pass on to an affection which by most practitioners is regarded as one of the commonest to which woman is liable—viz., *chronic inflammation and ulceration* of the neck of the womb. It is not forty years ago since a French physician, M. Recamier, invented an instrument—the speculum—for the application of local remedies to the neck of the womb in cancer; but the light which this instrument threw upon uterine conditions generally, led, among other results, to the conclusion, that leucorrhœal discharges (popularly known as *the whites*) were often derived from, and associated with, various morbid appearances of the mouth of the womb, and could often be removed by remedies directed to that part. Almost ever since the speculum began to get into general use, a large number of old-fashioned practitioners raised up a cry against its employment, on the grounds of its indelicacy, its inutility, etc., and denied the very existence of various morbid conditions, which the employers of the instrument declared they saw with its use. Hence two parties have arisen—one who believe in the speculum and its revelations; and another who reject the recent modes of investigating uterine diseases, who take small account of the new facts regarding *local* disease which have been revealed, and who regard uterine ailments as resulting from constitutional derangements, and who therefore trust mainly to general treatment. Now, although the view that the local disease is everything, may not be universally true, the opposite view is certainly untenable; and Dr. West and other writers on this

subject have pointed out that there are reasons why the womb should more frequently than perhaps any other organ be the seat of certain forms of local ailment, and should consequently require the frequent employment of local treatment. It would be out of place in these pages to describe the characters of the ulcerations or abrasions of the mouth of the womb, which are so frequently revealed by the speculum, or to enter into any detail regarding the high pathological importance attached by some writers to them. The conclusion which Dr. West draws from a prolonged investigation of this subject is, that "the condition of so-called ulceration or abrasion of the os uteri is far from infrequent, even in cases where no uterine symptoms were complained of during life; but that it is usually unassociated with other important affections of the uterus, such as may be supposed to be the effects of inflammatory action; and, further, that such affections do not seem to be readily excited by causes acting on the neck of the womb, either when displaced, or when the organ is in its natural position."—*Op. cit.* p. 120. Since uterine pain, disordered menstruation, and leucorrhœal discharges—the symptoms usually associated with ulceration of the mouth of the womb—are met with by impartial observers almost as frequently *without* as *with* ulceration, it may be fairly inferred that this ulceration is neither a general cause of uterine disease, nor a safe index of its progress; and although the local application of caustic to the os uteri is doubtless often successful in restoring the patient to health, it must not be considered as a general rule that the attempt, by local remedies, to remove this condition is the one and all-important point in the treatment of uterine disease. There is no doubt that, in the great majority of these cases (excepting a few of the more severe ones), temporary separation from the husband's bed, the recumbent position (which facilitates the return of blood from the womb and adjacent parts), due attention to the diet and state of the digestive organs, and the use of injections of nitrate of silver, which may be applied by the patient, are sufficient in a few weeks to effect a cure. Chronic uterine inflammation of a more general nature (as of the interior, or body of the womb), with very similar symptoms, is by no means rare. If the disease is met with in the acute form, leeches should be applied to the womb itself; in the chronic form, which is generally observed, the pain in the back is best relieved by a croton-oil liniment, composed, according to Dr. West's directions, of one part of croton oil to ten of the camphor liniment (of the London Pharmacopœia) which should be applied (without rubbing it in) with a sponge twice a day on the back, at the seat of pain. Belladonna plaster or liniment also gives temporary relief. The irritability of the bladder, which is a common symptom, is usually associated with abundant phosphatic deposits in the urine, and is best relieved by a combination of ten or fifteen minims of dilute hydrochloric acid, half a dram of tincture of henbane, and two ounces or more of decoction of pareira-brava (see CISSAMPELOS), three times a day; and the tepid hip-bath may be used with benefit. The same general rules as to rest, diet, etc., which have been already given, must be attended to. Under the best management, a tendency to relapse is liable to occur at each monthly period, and after several such relapses, the womb is found (on surgical examination) to be enlarged and hardened, and less movable than natural. This condition is best removed by the careful and prolonged use of bichloride of mercury in small doses, which, as it is a deadly poison, must only be taken by professional advice; but the pain in the groin which usually accompanies this change, may be relieved or removed by the application of a small blister. The profuse discharge—both menstrual and leucorrhœal—is best relieved by chalybeate preparations, of which the following is a useful and favorite compound: Take of sulphate of iron, 6 grains; sulphate of magnesia (Epsom salts), 3 drams; dilute sulphuric acid, half a dram; syrup of orange peel, half an ounce; caraway water, sufficient to make a mixture of 6 ounces, of which 1 ounce may be taken thrice daily, after meals; or if there be much hemorrhage, a mixture of alum and sulphate of iron (4 grains of the former to 1 of the latter, dissolved in a small tumbler of water) may be taken three times a day. A hip-bath, containing half a pound of alum to every gallon of water, is often very useful as an astringent. It should be taken in the morning before dressing, and the patient should remain in it at least a quarter of an hour. For the first time or two, the water may have the chill just taken off. The same importance is not at present attached to vaginal injections as when it was believed that the vagina (and not the womb) was the main source of leucorrhœal discharge. In a case of leucorrhœal discharge of long standing, an excellent astringent injection may be formed by dissolving two drams of tannin and half an ounce of alum in a quart of water. Special forms of female or vaginal syringes are sold for this purpose. Of the application of caustics to the mouth of the womb, we say nothing, as that is a matter which must be left solely to the medical attendant.

From these remarks on the diseases of this important organ, we pass on to a very brief notice of its occasional *misplacements*. The singular mobility of the womb (without which pregnancy would be almost an impossibility) exposes it to the risk of displacement to such a degree as often to give rise to great personal discomfort. As all the causes which tend to produce displacement (such as increased weight of the organ during pregnancy, pressure of the superincumbent viscera, etc.) act in a downward direction, the obvious tendency of the womb is to be thrown downward, or to suffer *prolapsus* (q.v.), an affection which, in its extreme degree, when the organ is more or less protruded externally, is termed *procidentia*. Causes sometimes come into play which incline

the upper part of the uterus either backward or forward, giving rise to *retroversion* and *anteversion*, instead of mere prolapse. Prolapsus is sufficiently considered in the article bearing that title; and for a description of the symptoms and treatment of the two last-named misplacements, we must refer our readers to the standard works on the diseases of women.

The tendency of the womb to hypertrophy has been noticed at the beginning of this article; its individual tissues have a similar tendency to overgrowth, showing itself at particular parts, and thus giving rise to tumors or outgrowths, which are more common in this than in any other organ. Under this head may be mentioned several varieties of *polypus*, which differ essentially in structure, but all of which are invested by the mucous membrane which lines the uterus, and are liable to be the source of hemorrhage. Their removal by surgical means is generally a matter of no difficulty. Much more important than these is the *fibrous tumor*, which is frequent in its ocurrence, serious in its effects, and very slightly amenable to treatment. These tumors are of a spherical form and firm texture, resembling that of the womb itself, and usually occur in groups; several being frequently present, while one or two are considerably larger than the others. The symptoms to which they give rise vary extremely according as the chief tumor lies on the outer part of the womb, and grows into the abdominal cavity, or is developed within the walls of the womb, or projects into the interior. They may be of almost any size, cases being on record in which they weighed from 70 to 80 pounds. In regard to the symptoms of this affection, it must be premised that sometimes these tumors exist without exciting any disturbance, and that growths on the outer surface give rise to comparatively unimportant derangements, compared with those which are imbedded in the walls, or occupy the cavity of the womb. It will be readily understood that women who have passed the change of life (as it is popularly called) suffer less from these tumors than younger women. The diagnosis of fibrous tumor is effected partly by manual and instrumental examination (into which we shall not enter), and partly by the symptoms—such as (1) hemorrhage occurring in about 50 per cent of cases independently of their nature; (2) disturbance of the menstrual discharge in 62 per cent of cases, it most commonly being excessive and often painful; (3) pain, usually constant, and occasionally only at the menstrual period, described by some patients as a burning sensation, by others as a sense of bearing down, and by a few as occurring in paroxysms of intense agony; (4) dysuria—pain in voiding urine, or difficulty in discharging it, or frequent desire to pass it. It is usually hemorrhage, or inability to void the urine, that first directs the attention of the patient to her malady. Its tendency to excite abortion often leads the physician to suspect its presence. Although, as we previously mentioned, this is an affection little amenable to treatment, a woman with these symptoms should at once consult a physician (if possible, the physician-accoucheur to a large hospital), who, by his advice as to the general management of the case, especially during the menstrual period, may do much to palliate her sufferings. Iodine, bromine (and certain mineral waters containing these elements), and mercury have been vaunted as specifics, but nothing positive can be said regarding their successful action; and certain surgical operations have been recommended, which are accompanied with so much danger to the patient that it is needless to refer to them. But although the action of medicines on these growths is avowedly uncertain, nature in this as in many other cases not unfrequently strives toward a more or less complete cure. For example, if the tumor is pediculated, and lies in the uterine cavity, the pedicle may finally give way, and the tumor may be expelled; or certain changes may take place in the interior of a tumor, leading either to its disintegration and elimination, or to its conversion into a chalky mass, which, though not eliminated, induces no local disturbances. These spontaneous cures are by no means rare, although we can hardly lead the patient to expect them in any special case.

We shall conclude with a few words on a disease which is the most painful and hopeless of all the disorders to which humanity is liable—*cancer of the womb*. It is a disease whose leading features as thus graphically—we may almost say, painfully—described by Dr. West: "Pain, often exceeding in intensity all that can be imagined as most intolerable, attended by accidents which render the sufferer most loathsome to herself and to those whom strong affection still gathers round her bed; the general health broken down by the action of the same poison as produces the local suffering, and all tending surely, swiftly, to a fatal issue, which skill cannot avert; from which it can scarcely take away its bitterest anguish." The three most constant symptoms are pain, and hemorrhage, and discharge. From an examination of 132 cases by the above-named physician, the first symptom was found to have been,

In 58 instances,	or	43.9	per cent,	hemorrhage without pain.
" 26	"	19.6	"	pain of various kinds.
" 18	"	13.6	"	hemorrhage with pain.
" 18	"	13.6	"	leucorrhœa or other discharge without pain.
" 12	"	10.3	"	pain and discharge sometimes offensive.

It is unnecessary to enter into further details regarding the symptoms of this disease, as cases of this nature must always be under medical superintendence, and for the same reason we need only say regarding the treatment, that it is divisible into the *palliative*

and the *curative*, the former being directed toward the three great symptoms, and the general symptoms of the cancerous cachexia (or constitution), while in the latter are included the operation of extirpating the whole womb, or removing the neck of the womb by ligature or excision. It is difficult to speak with accuracy regarding the frequency of this disease. An approximate estimate may be formed from the fact that, in 1877, the mortality from cancer in England amounted to 3,923 males and 8,038 females; the excess in the latter case, amounting to 4,115, must be due to cancer of the breast or womb; and according to Tanchou, a French pathologist, cancer of the womb is more frequent than that of the female breast in the rate of 26 to 10. Hence the yearly deaths from uterine cancer in England amount to about 2,972. The last-named writer calculated, from ten years' observation of the French records of mortality, that this disease causes 16 per 1000 of all female deaths. The disease is very rare before the 25th year, and by far the most common period of its appearance is between the ages of 40 and 50 years. Its average duration is 16 or 17 months, but it may prove fatal in 3 or 4 months. On the subject of cancer of the womb, Walsh *On Cancer* may be consulted; and for further information on the subject of this article generally, the reader is referred to the standard works of Churchill, Lever, Simpson, West, etc.

WO'MBAT, *Phascolomys,* a genus of marsupial quadrupeds, constituting a distinct family, *phascolomydæ,* and of which only one species is known, *phascolomys wombat,* a native of Australia, abounding chiefly in mountainous districts of New South Wales, Victoria, South Australia, and Van Diemen's land, and in the islands of Bass's strait. In many of its characters, it resembles the *rodentia.* The incisors are two in each jaw, long, and chisel-like; they are hollow at the base, and continue to grow as they are worn away; there are no canine teeth; and the molars are five on each side in both jaws. There is a wide gap between the incissors and the molars. The wombat is an animal of clumsy form, having stout limbs and a blunt muzzle. It is 2 or 3 ft. long, plump, with a thick coat of long, grayish brown, coarse wooly hair; the head large, flat, broad, with small eyes and ears, the upper lip cleft; the feet five-toed, the claws long, except those of the inner toes of the hind feet; the tail very short. It is plantigrade, and the soles of the feet are broad and naked. It is nocturnal in its habits, slow in its motions; feeds on vegetable substances, and digs up roots with its claws; it makes its abode in holes among rocks, or in burrows dug by itself. It produces three or four young at a birth. It is a creature of little intelligence, but gentle, and easily domesticated to a certain extent, not seeming to care much for any change of circumstances, so long as its wants are supplied. It shows considerable snappishness, however, if provoked. Its flesh is preferred to that of any other quadruped of Australia. It is generally fat, and in flavor resembles pork. The remains of a fossil species have been found in the caves at Wellington valley, Australia. See illus., MARSUPIALIA, vol. IX.

WOMEN, MEDICAL EDUCATION OF. The medical education of women is recent. Facilities are now offered to women for the study of medicine in the United States, England, and the continent of Europe. Diplomas have been granted to women by the faculty of Paris, where the range of study is extensive and arduous. The German universities are not so favorable to the pursuit of medical studies by women, but the German cities are visited by them for private instruction. The University of Zürich in Switzerland is attended most by women, where a number always are in attendance upon full courses of lectures and instruction. There is an independent medical school for women in London, which was established principally in consequence of the exertions of Dr. Elizabeth Blackwell of New York. More encouragement, however, has been given to the medical education of women in the United States, and there are now numerous institutions which afford ample opportunities. In the commencement of the movement, the teaching was done by irresponsible and irregular persons, so that for a time there was necessarily a considerable want of confidence among intelligent people in female doctors, but recently much of this has been corrected, and many institutions pursue a thorough course. The Women's Medical College of Pennsylvania at Philadelphia has been in existence over thirty years, and has an efficient faculty composed of both men and women of good professional standing and attainments. The New York Infirmary for women and children is now nearly half a century old. It was founded by Drs. Emily and Elizabeth Blackwell. From the first this institution was conducted by women. During the past fifteen years, it has maintained an associate medical college, with a full faculty of regular professors and teachers. The New England Woman's Hospital of Boston is in good standing, and the medical department of the university of Michigan at Ann Arbor admits both sexes. Other institutions for the medical education of women are the Women's Hospital Medical College of Chicago, Ill., and the University of Wooster, at Cleveland, Ohio.

WOMEN, PRIVATE COLLEGIATE INSTRUCTION FOR. See COLLEGIATE EDUCATION FOR WOMEN.

WOMEN'S RIGHTS. In 1851 an article in *The Westminster Review* attracted attention to the novel subject of the enfranchisement of women. Since that time the agitation for women's rights has in Great Britain, and to a still greater extent in America, attained the dimensions of a political movement. The subject has, therefore, become one of general interest. The following is an account of the claims included in women's rights, and a brief statement of the chief arguments by which those claims are supported:

1. *The Political Rights of Women.*—The discussion has hitherto turned upon the right to the suffrage. The right to vote is claimed in accordance with the principles of political reasoning that are held conclusive in the case of men. The argument applies with peculiar force to a democratic constitution. Democracy involves two ideas. It is a protest against privilege and against despotism; it maintains that every individual is born with an equal right to the protection and consideration of the law; and it affirms that every one must have a vote in order to secure this fundamental right. The practice of the United States shows a gradual approach to those principles. Till lately, the negroes were refused the benefit of them; but the privilege founded on color has perished, and there remains now only the privilege founded on sex.

In England the right to vote has been made to rest on the principles of English law. A petition of women to the house of commons, presented on June 7, 1866, set forth that the possession of property in this country carries with it the right to vote in the election of representatives in parliament. From the earliest times the principle of the English constitution, and the spirit of the English people, have required that no man's property should be taken for the purposes of government without his consent. Since, therefore, the English law permits women to hold and manage property, it seems anomalous and inconsistent that it should refuse them a vote to protect their property from inordinate taxation. Other persons allowed by the law to hold property, but excluded from the suffrage, are minors, idiots, lunatics, and criminals. But the principle of disqualification in those cases does not apply to women. Moreover, there is alleged to be historical evidence that women have voted both in counties and boroughs. The disuse of the privilege is traced to historical causes. Such was the violence of the time that women were often unable to administer their property, and it was therefore natural that they should take little part in elections. Besides, the right to vote was at first regarded, not as a privilege, but as a burden; for the power of the commons was low, and the expense of paying members of parliament was considerable. The disfranchisement of women is therefore held to be an anomaly in the constitution, as it was an accident in history.

The objections to female suffrage are various. In an argument in the *Times* it is said: "There exists, as it were, a tacit concordat guaranteeing to the weaker sex the protection and deference of the strong, upon one condition only: that condition is the political dependence of women." This asserts a claim on the part of men to make laws for women, in return for protection and deference. Now, protection to person and property every one has a right to who obeys the laws and contributes to the support of the government. The reason for refusing votes to women must lie deeper. It may be said that, inasmuch as women are weak and at the mercy of men, men abstain from abusing their superiority only on one condition; that condition is, that women shall have no legal rights except those that men are pleased to give them. In the last resort the rights and privileges of any class of men depend on their might. The nobility established their privileges when they had power. The working-class has been admitted to the franchise because its power has increased. But women have no physical power to enforce their rights. If rights are to be measured by might, women will occupy the bottom of the scale. This is their position among savages. But, as civilization has advanced, men have learned to renounce the advantage of their physical superiority, and freely to give women privileges that could not have been extorted. It would, therefore, seem that the rights women actually enjoy do not depend upon, and are not to be measured by, their physical strength. The rights of women flow from the prevailing sense of justice, and justice now means that the interests of women be consulted with as much impartiality as the interests of men. An unjust preference of either would be mischievous to both. Since, then, the interests of women should be fairly considered, what reason can there be to prevent them voting, and thereby intimating what views they take of their own interests?

Another objection to the enfranchisement of women is that women have no business with politics, and that politics would withdraw them from their proper duties. Is this apprehension well founded? Granting that domestic life is the proper sphere of women, is it really impossible to unite an interest in politics with attention to a family? Upon this subject we are not altogether without experience. In the great dissenting churches in Scotland women, though excluded from office, vote equally with men in the appointment of ruling-elders, ministers, and in everything that is decided by a popular vote. But this privilege has not "hardened" them or made them "unfeminine," or interfered with their household work. On the other hand it has largely contributed to the success of the voluntary system, and to the strength of the church. The chimerical nature of the alarm felt on this subject has been illustrated by the objections that might be made against allowing clergymen to vote. "We should be told that clergymen have no business with politics; that it was their province to attend to spiritual matters, and that they ought to confine themselves to their proper sphere; that if they were permitted to participate in political affairs, it would deteriorate from the sanctity of their character; that the passions roused by political contests were inconsistent with that spirit of meekness and holiness which we look for in preachers of the gospel." Women are not wholly excluded from politics. In some countries a woman may be sovereign; and history affords many examples of women that have had the highest capacity for government. Women in Great Britain if they have the same qualification as men, have parochial

votes. And few would go so far as to propose that women should not only be shut out from public affairs, but also be kept ignorant of politics. Even if family-life be made their sole occupation, it surely is not to bound the horizon of their knowledge and sympathies.

The remaining objections may be taken together. They are of the same kind as those recently employed against the enfranchisement of the working-class. They are briefly: That the interests of women are not neglected, for they are represented by their male connections; that women are ignorant of politics; that they would be exposed to intimidation at home, and to violence at the polling-booths; and lastly, that women do not want votes. It is not allowed that women are sufficiently represented by their male connections. Such indirect influence is not considered, in other cases, to be a reason for withholding the suffrage. Rich men have a great indirect influence, but they have also votes. It is an old argument that operatives were represented by their employers; but that argument never convinced the operatives, and it has now ceased to affect the legislature. Why, then, should a *vicarious* representation, which is repudiated by every class of men, be considered sufficient for women? On the contrary, if women had votes their interests would be better attended to, because no member can disregard with impunity any important section of his constituents. It would be the policy of statesmen to devise and carry out measures for their benefit.

But, it is said women are ignorant of politics. This objection has lost much of its weight, now that household suffrage has been established. Educated women are surely not behind many of the new voters in political knowledge. Still, women, in general, know less of politics than men. They are constantly told that politics form no part of their business, and their opinions, like those of non-electors, have little direct and palpable influence on affairs. Political knowledge generally follows political power. Women have not the stimulus that acts on men; they have not the knowledge that their opinions form part of the legislative power.

There is little reason to fear that the possession of a vote would expose women to coercion and improper influence. The law has already defied a more serious danger. It permits women, and by special arrangement, even married women, to hold property, and it trusts its ability to protect them from the importunities of relations. If women can defend their property from greedy relatives, they will be no less able to give independent votes. The objection that women would be exposed to violence at the polling-booths, is not formidable. If such were the fact it would be no argument against female suffrage; it would be an argument against polling-booths. Should the police, however, be unable to protect female voters, there is the easy resource of voting-papers, already in use in the elections in the English universities.

The last objection is, that women do not want votes. A large number petitioned the commons in favor of extending the franchise to women that possessed a household qualification; those petitioners represent a very much larger number, who are kept back by the various social checks that prevent women taking part in political agitation. Nor can there be any doubt that a proposal that makes way with men simply on the ground of justice, will find still more favor with women, since their interest is ranged on the same side.

The claim of women to the suffrage is not without support from practical considerations. History teaches that women must have votes in order to protect their interests; men, through all the vicissitudes of history, have shown a constant preference of their own interests. In the words of lord Macaulay: "If there be a word of truth in history, women have been always, and still are, over the greater part of the globe, humble companions, playthings, captives, menials, beasts of burden. Except in a few happy and highly civilized communities, they are strictly in a state of personal slavery. Even in those countries where they are best treated, the laws are generally unfavorable to them, with respect to almost all the points in which they are the most deeply interested."

Till very lately there was in Great Britain no provision for the highest education of women. Many of the charitable endowments for education were destined by the founders for girls as well as boys, but have generally been appropriated to the latter. Christchurch hospital, in London, for example, educated 1100 boys and 26 girls. But of late much has been done for women's higher education. Girton and Newnham colleges (see CAMBRIDGE UNIVERSITY), Cambridge, were opened for female undergraduates in 1873 and 1875 respectively. Oxford now extends similar privileges. The Scotch associations for university education of women have obtained lectures for women by university professional teachers. In the facilities for education, women still suffer serious disadvantages.

English law is unfair to women, especially the law of marriage. Marriage is based on free consent, and is supposed to imply the approval of both parties. Now, it would be a hard bargain, where one of the parties was offered all the terms of it in the lump, and was therefore obliged to take everything or reject the whole; yet all the incidents of marriage, all the terms of the contract, are fixed by the law, and the law is made by men. In constituting the relation of marriage—a relation of even greater importance to women than to men—women have no voice, they have only a barren and impracticable veto. The result is familiar to every lawyer. By the law of England, the custody of a woman's children, after seven years of age, belongs exclusively to her husband; after they reach that age, she has no right even to see them. The common law strips a

woman of her property, and leaves her fortune at the mercy of her husband; the husband also can seize his wife's earnings, unless she is protected by a judicial separation, or by an order from a magistrate. A married woman cannot enter into contracts. In practice, this bad law is avoided by settlements made before marriage; but this protection involves expense, and is in a great measure confined to the rich. More recent legislation is as unfair as the older law. In 1857 the divorce court was established, and it was enacted that, for adultery on the part of a wife, the husband could obtain a divorce; but for the adultery of a husband, a wife was not allowed a divorce. In addition to adultery, the husband must be guilty of cruelty or desertion. (The Married Women's Property acts of 1881 and '82 give a woman powers over her movable and personal estate, whether acquired before or after marriage; which, secured on herself, will not be liable to arrestment for the husband's debts. This does not effect ante-nuptial contracts). The law of the realm is comparatively lenient in punishing brutal assaults by husbands on wives; garroters are flogged, but not wife-beaters. Finally, in the words of lord Brougham, "There must be a total reconstruction of the law, before women can have justice."

2. *The Industrial Rights of Women.*—These embrace admissibility to all offices, occupations, and professions; also admission to the universities, or some adequate provision for the education of women so as to fit them for high posts. This raises the question of the proper sphere of women. The prevailing ideas point to marriage as the true, if not the sole end of a woman's existence; but this theory is inadequate to meet our social difficulties. Many women are unmarried. What is to be done with them? To hinder them from doing the best they can for themselves, would be a manifest injustice; therefore, in the interests of single women, all occupations should be open. But the claims on behalf of women do not stop there. It is denied that men have any right to exclude women from active life, and so drive them into marriage as their only livelihood. On grounds of justice, the right of women to enter into industry is conceived as almost too clear for argument.

The objections to the industrial rights of women must be noticed briefly. It is said that the proper sphere of women is domestic life, and that she is by nature unfit for the struggles of industry. It appears from the census that just one-half of women above twenty years of age are confined to domestic life. About a third of the adult female population are either of independent means, or support themselves by non-domestic industry; the rest occupy a secondary position in the industrial world, by assisting their husbands in business. But though the number of women engaged in industry is great, they are confined to poorly-paid occupations, and their labor is for the most part unskilled. Generally speaking, the women of the middle class take no part in industry. The real issue is therefore narrow. It is not, shall women be admitted to industry? for that is settled; but, shall skilled and educated female labor be allowed? There is no evidence that women have no capacity but for the meanest employments. What they are fit for, can be finally determined only by actual trial. All that the advocates of women's rights ask is, do not anticipate the result, or foreclose the experiment. Some think that while it is desirable women should not be left unoccupied, they should not be admitted to industrial occupations, but society should seek a field for unmarried women, in some works of charity or religion, or in some semi-domestic pursuit. This proposal is an attempt to establish, in Great Britain, that provision for unmarried women that is supplied by the monastic system in Roman Catholic countries. The objection to it is clear. If this semi-domestic pursuit is the most agreeable and lucrative to women, they will, of course, hail the discovery of it with gladness; but if it is not, they may decidedly object to make martyrs of themselves.

A common objection is, that to take women from domestic work would harden them, and destroy the peculiar traits of their character. Now, a great part of what used to be the work of the household has passed to another province; spinning, weaving, brewing, and baking were at one time domestic work. If women are to do their ancient customary work, they must follow it abroad. Those who believe that the peculiar attributes of women are an artificial product of civilization, may feel alarmed at any disturbance of the present condition. But the genuine distinctions between the sexes flow from organization, and will not be obliterated by similarity of education and employment; on the contrary, no feminine charm would be lost, but women would be more spirited, more intelligent, and fitter companions for men.

It is an argument sometimes relied upon that an admission of women to industry would be prejudicial to men, because it would increase the supply of labor, and thereby lower the rate of wages. This objection is founded on the principle that, when the wage-fund is constant, the rate of wages falls as the laborers are more numerous, and rises as they become less numerous. But the competition of women is, to some extent, an exception, for if they do not work for themselves they must be supported out of the wages of men. If, however, wages were to fall below the ordinary standard of comfort, the tendency would be, by fewer births or emigration, to reduce the excess of laborers till the supply of labor should be adjusted to the required standard of wages; and experience shows that wages are not permanently lowered by the admission of women to industry. In the working-class wages adjust themselves to a scale enabling a workingman to maintain a wife and family.

In the last place it is said that active life is inconsistent with the cares of maternity. This, of course, has no application to the large class of childless women; and there can

be no necessity for prohibiting women from entering into industrial life if their situation renders it impracticable. The incompatibility between active life and maternity may safely be left to look after itself. From the returns in the census it appears that one out of eight married women are employed in non-domestic labor; but, since many of their occupations are not incompatible with household duties, and since many have no children to attend to, it seems probable that only among a small number of the working-class the duties of maternity are sacrificed to outdoor employment. It is, however, a moot-point how far maternity interposes a barrier to the industrial education and employment of women. In the working-class the mother usually nurses her children, for she could seldom make a profit by engaging in an another employment, and hiring a servant; but if women were employed in skilled and well-paid occupations, they would probably leave nursing, which at present is unskilled labor, to servants. The solution of the problem must, however, be left to trial and experience. One principle, at any rate, is clear; except in so far as women are occupied as mothers, they should be employed in the most remunerative work. That would be beneficial to men, for it would relieve them of a pecuniary burden; it would be beneficial to women, for it would make them independent.

The women of the middle class, led astray by a mistaken aspiration to aristocratic leisure, have held aloof from the struggles and rewards of industry. This operates injuriously in various ways. It creates an unnatural competition with working-women, as in needle-work. Middle-class women often discharge duties that might well be left to upper servants. If they entered into commerce and trade they would fit themselves for, and require, a higher kind of occupation than those thankfully accepted by poor and untaught women. At present the higher walks of business, and even subordinate offices of trust and skill, are monopolized by men; hence women engaged in the lower employments derive little pecuniary benefit from trustworthiness, experience, or judgment, and have no hope of rising. If they should attempt to better their condition they are left without encouragement or support. The exclusion of women of the middle class from industry is hurtful to themselves. It often leads to poverty of the bitterest kind—the poverty of gentlewomen. It leaves them without occupation, a prey to *ennui* and bad health. It also forbids perfect companionship and sympathy between the sexes. The whole scope of a man's education is toward industry. In it he lives, and moves, and has his being. But of this world women have no direct knowledge. Hence a want of intellectual sympathy between men and women and an absence of any common standard of reasoning and evidence. Nor is this all. The virtues upon which industrial and public life repose do not derive due support from women. They are ignorant of the difficulties that beset moral problems under circumstances of which they have no experience, and their moral wisdom can hardly go beyond traditionary saws. Indeed, their influence is sometimes on the wrong side. A man will be reluctant to injure his family in their pecuniary interests for some point of conscience that his wife does not sympathize with, or for objects that she does not understand.

No account of women's rights would be complete without some notice of the claim to equality in marriage. This is the goal to which history points. "Among tribes which are still in a primitive condition, women were and are the slaves of men for purposes of toil. All the hard bodily labor devolves on them. In a state somewhat more advanced, as in Asia, women were and are the slaves of men for purposes of sensuality. In Europe there early succeeded a third and milder dominion, secured, not by blows, nor by locks and bars, but by sedulous inculcation on the mind; feelings also of kindness, and ideas of duty, such as a superior owes to inferiors under his protection, became more and more involved in the relation. But it did not for many ages become a relation of companionship, even between unequals." That stage has now been attained, and, "for the first time in the world, men and women are really companions." Women cannot be good companions for men unless they are equals. If they are kept inferior in education and knowledge their influence will tend to drag men down to their own level. The intercourse, moreover, that is of value is not intercourse between an active and a passive mind, but between two active minds. The theory of the subordination of women involves several bad consequences; for, women being unable to attain their ends directly, have recourse to management and artifice.

In the year 1869 an important step was taken toward the recognition of the claim for the concession of political franchises to women. In a bill passed in parliament respecting municipal elections a clause was inserted extending the right of voting at such elections to women. Similarly, by the English and Scotch education acts of 1870 and 1872, women are permitted to vote at the elections of school-boards.

Women's rights in the United States have very sensibly advanced within the last 20 years in important particulars. The right of suffrage is not generally conceded as yet, nor is it likely soon to be, but important experiments have been made in that direction. Thus the territory of Wyoming in 1869 gave women the right of suffrage and admitted them as jurors; the state of Massachusetts allows women to vote in town elections for members of the school committees, and to be eligible for the position; and in both cases the experiment seems to have been fairly successful. The more prominent members of the woman's suffrage associations have claimed the right to vote under the U. S. constitution as it now stands, but all test cases have been decided adversely. The

most noted of these cases are the appeal of Virginia L. Minor from the Missouri supreme court, in which an adverse decision was given by Waite, chief-justice of the U. S. supreme court, in 1874, and that of Susan B. Anthony and others, tried in 1873 before Justice Hunt, of the supreme court, in the U. S. circuit court for northern New York. Salutary legal reforms as to the property rights of married women have been made in New York, Connecticut, and many other states, the general result being to give a married woman control of her separate property and of that acquired by her own skill or labor after marriage. There are at present two great branches of the women's suffrage movement in this country—the national association, of which Elizabeth Cady Stanton, Susan B. Anthony, Matilda Jocelyn Gage, and others are prominent members; and the American woman's suffrage association, with which Mrs. Lucy Stone, Julia Ward Howe, and Mrs. Livermore are connected.

WOOD, a co. in n. Ohio, having the Maumee river for its n.w. boundary, drained by the Portage river and Beaver creek; 623 sq.m.; pop. '90, 44,392, chiefly of American birth. It is intersected by numerous railroads. Co. seat, Bowling Green.

WOOD, a co. in n.e. Texas, having the Sabine river for its s. boundary, drained by the Lake Fork; 700 sq.m.; pop. '90, 13,932. Co. seat, Quitman.

WOOD, a co. in w. West Virginia, having the Ohio river for its n.w. boundary, separating it from the state of Ohio, drained by the Little Kanawha river; 375 sq.m.; pop. '90, 28,612. Co. seat, Parkersburg.

WOOD, a co. in central Wisconsin, drained by the Wisconsin and Yellow rivers and Mill creek; 828 sq.m.; pop. '90, 18,127, chiefly of American birth. Co. seat, Grand Rapids.

WOOD, Alphonso, 1810–81; b. N. H.; graduated at Dartmouth in 1834; studied at Andover seminary one year; taught at Kimball Union academy, Meriden, N. H., 1834–49; followed civil engineering; president of Ohio female college, 1851–57; professor in Terre Haute female college, 1857–60; principal of Clinton female seminary, Brooklyn, N. Y., 1860–65. He was a distinguished botanist. His publications are: *Class-Books of Botany*, which has had an extensive sale; *First Lessons in Botany; The American Botanist and Florist; Leaves and Flowers; Flora Atlantica.*

WOOD, Anthony, of some note as an antiquary, was born at Oxford in the year 1632. His school education he received chiefly in the place of his birth, and in 1647, he was entered at Merton college as a gentleman commoner. In 1652, he took his degree as bachelor, and in 1655, became master of arts. Deriving from his father an independence, he seems at first to have aimed at being a sort of Jack-of-all-trades, as not bound in penalties of hunger to follow out any particular one. He practiced the fiddle assiduously, and is said to have attained considerable skill. Painting was also one of his innocent hobbies, but none of his pictures has been preserved to enable us to test his proficiency. In addition to these accomplishments, it was his whim to concern himself with heraldry and other antiquarian pursuits. He labored much in the libraries, and presently came to be noted for his curious turn that way. In 1656, he came upon Dugdale's *Antiquities of Warwickshire*, shortly before published, the perusal of which greatly delighted him, and awoke in him the fire of emulation. He now worked still more assiduously; and went about among the tombs, copying old inscriptions. As the fruit of these learned labors, he gave to the world, in 1669, his *History and Antiquities of Oxford.* For the copyright of this work Wood received £100 from the university; and Dr. Fell, dean of Christ Church, thought so highly of it that he employed one Peers, a student, to execute a Latin translation of it. The *Historia et Antiquitates Universitatis Oxoniensis* was published at Oxford in 1674.

Subsequently, in 1691, as result of his further investigations, Wood published his *Athenæ Oxonienses*, containing a full and particular account of all the authors, bishops, etc., who had adorned that seat of learning from 1500 to 1690. In this work, he attacked the character of the great lord Clarendon, deceased; a misdemeanor for which he was prosecuted at the court of the university, and expelled. He did not long survive this disgrace, dying Nov. 28, 1695. His books, and a selection of his manuscripts, he left to the university of which he had ceased to be a member, and they are preserved in the Ashmolean Museum. His life may be found at large in the edition of his *Athenæ Oxonienses* issued by Dr. Bliss in 1848.

WOOD, De Volson, A.M., an American engineer and physicist, was born at Smyrna, N. Y., in 1832, and was educated at the State Normal School at Albany and at the Rensselaer Polytechnic Institute at Troy, where he graduated in 1857. He taught mathematics in the normal school, 1854–55. He was professor of civil engineering in the University of Michigan, 1857–72, and in 1872 was called to the chair of mathematics and mechanics in the Stevens Institute of Technology, at Hoboken, N. J. He has published the treatises *On The Resistance of Materials* (1871); *On Bridges and Roofs* (1873); *The Elements of Analytical Mechanics* (1876); *Co-ordinate Geometry* (1879); *Reaction Motors*, etc.; and has invented a rock-drill, an air-compressor, and a steam-pump.

WOOD, Ellen (Price), 1814–87; b. England; became a magazine and story writer, and published a large number of novels, mostly sensational, but very popular. Among those most read are *East Lynne*, *The Channings*, *Trevelyn Hold*, and *Red Court Farm.*

WOOD, Fernando, 1812–81, b. Philadelphia, went to New York in his youth, engaged successfully in business, and became a ship-owner. He took part in local politics and in 1840 was elected to congress, serving in 1841–43, 1863—65 and from 1867 to the time of his death. He was mayor of New York, 1854 and 1861, and in the latter year, during the civil war is said to have made the astounding recommendation that New York should secede and become a free city. Though opposed to the war against secession he favored its prosecution after it broke out. He was one of the ablest leaders of the democratic party in congress; and the tariff bill of 1878, reported by the committee of which he was chairman, was one of the most important measures introduced of late years.

WOOD, George B., ll.d., 1797–1879, b. N. J.; graduated at the university of Pennsylvania, which gave him a medical degree in 1818. He held the chair of medicine at the Philadelphia college of pharmacy, 1822–31, and of materia medica at the same institution, 1831–35. He was professor of materia medica at the university of Pennsylvania, 1835–50, and of the theory and practice of medicine, 1850–60. Among his works are *A Treatise on the Practice of Medicine* (1847), and *Therapeutics and Pharmacology* (1856).

WOOD, Gen. Sir Henry Evelyn, V.C., K.C.B., G.C.M.G., K.C.S.I., b. at Cressing, Eng., in February, 1838; entered the English Navy at fourteen years of age, and was present at the siege of Sebastopol. He was wounded in the assault on The Redan (June 18, 1855); received the Crimean medal and other tokens, and was made a knight of the French Legion of Honor. He subsequently entered the British army as ensign in the 73d Regiment. He was promoted in rank, after his excellent service in the Indian Campaign of 1858, being major in 1862. In 1860, he won the Victoria Cross for valorous service in India, and was also frequently mentioned with approbation by Gen. Garnet Wolseley, commander of the English forces in the Ashantee War of 1873–74. This brought him the brevet rank of Colonel, and once more the medal with clasp. He served through the Zulu War of 1879, in command of No. 4 Column, raising "Wood's Irregulars," from one thousand friendly Zulus. In more than one hot engagement he defeated the Zulus, and was made K.C.B. upon his return to England. He commanded in the Transvaal War (1880–81) and served in the expedition to Egypt (1882), receiving the thanks of parliament. In December, 1882, he was appointed Commander-in-chief of the Egyptian army, and in July, 1883, he was made Knight Commander of the Star of India. He was made quartermaster-general in 1893 and general in 1895.

WOOD, James, 1750–1813, b. Va.; a delegate to the Virginia convention of 1776. The same year he was appointed a col. in the Virginia militia. He was afterward lieut.-gov. of Virginia, served on the executive council, and was gov., 1796–99. He was a son of Col. James, who founded the town of Winchester. Wood co. was named from him.

WOOD, James Frederic, b. Philadelphia, 1813; educated in England; from 1827 to 1837 resided in Cincinnati and was a bank officer. In 1837 he went to Rome, studied for the priesthood for seven years, and then returned to Cincinnati and became assistant rector in the cathedral. In 1857 he was consecrated coadjutor-bishop of Philadelphia, and in 1860 succeeded to the bishopric. He visited Rome several times and attended the Vatican council of 1869. In 1875 he was consecrated archbishop of the newly-created see of Philadelphia. He d. 1883.

WOOD, John George, b. London, 1827, educated at Oxford, and ordained in the church of England. He has written several popular works on zoölogy, such as a *Popular Natural History;* and *Sketches and Anecdotes of Animal Life.* Among his other works are *Homes without Hands; Insect Life; Natural History of Man; Natural History,* his principal work; *Man and Beast; Insects Abroad;* and *Horse and Man.* He died 1889.

WOOD, Thomas Jefferson, b. Ky., 1823, appointed to the topographical engineers after graduating at West Point in 1845. He served in the Mexican war, and was afterward stationed on the Texan frontier. In 1862, at the head of the 6th division of the army of the Ohio, he was at Shiloh and Perrysville, and was wounded at Stone river. He commanded a division in the 21st corps, in the Tennessee campaign in 1863, and was at the battle of Chickamauga. At Missionary Ridge he commanded a division of the 4th corps, was at the capture of Atlanta, and commanded the 4th corps in the campaign against Hood in Tennessee. He resigned with the rank of maj.gen. in 1869.

WOOD, William Maxwell, 1809–80, b. Baltimore, entering the navy as assistant surgeon, he was appointed surgeon in 1838, was fleet surgeon to the Pacific squadron 1844–46, and to the north Atlantic squadron, 1861–65. He became chief of the bureau of medicine and surgery in the navy department in 1871, was appointed surgeon-gen. in 1871, and retired in 1872. He has published several books of travel.

WOOD and WOOD FIBRE. Flowering plants agree with the higher cryptograms (ferns, club-mosses, horsetails) in the possession of "fibro-vascular bundles" (see Vascular Tissue), longitudinal strands of tougher consistence than the cellular tissue (q.v.) by which they are surrounded. These bundles are always readily distinguished into two main constituents, *wood* and *bast;* which may be arranged either in a *collateral* or in a *concentric* manner; in the former case the wood and bast are placed side by side in the bundle, and in the latter the bast surrounds the wood. In flowering plants the former arrangement prevails; in vascular cryptograms, the latter. In cryptograms and mono-

cotyledons, the bundle is incapable of growth after its first formation, all the embryonic tissue being used up at once; but in dicotyledonous plants (see EXOGENOUS PLANTS), the bundles exhibit continuous increase in thickness throughout the life of the plant by virtue of the persistence in active growth of a layer of embryonic tissue, the so-called cambium (q.v.) which remains in the middle of the fibro-vascular bundle, interposed between wood and bast, both of which thus increase in thickness. Since the bundle lies in the cellular matrix, with its woody portion directed towards the center, and its bast towards the circumference, the interposed cambium deposits each new layer of wood *outside*, and each new layer of bast *inside* the former ones; and the term *exogenous*, commonly applied to the growth of dicotyledonous stems, is thus seen to be applicable as regards the woody portion of their fibro-vascular bundles only.

The fibro-vascular bundles of monocotyledons lie scattered separately through a cellular matrix, the *ground substance* of the stem, which thus rarely possesses any great consistence, and has no separable bark. In dicotyledonous stems, on the other hand, the bundles anastomose at frequent intervals in their course along the stem, and this characteristic distinction can be readily seen by examining the stems of any two types of these groups, say of a lily or a geranium, or, more simply, by inspection of their leaves, in which a similar arrangement of bundles prevails—that of the former exhibiting parallel, that of the latter reticulated venation. The cambium, too, tears readily; thus dicotyledons have a separable bark.

In the dicotyledonous stem, that portion of the cellular ground-substance which remains at the center, within the bundles, is termed *pith*, that which lies wholly exterior to them under the epidermis is the cellular envelope; while the narrow plates of cells lying between and separating the anastomising bundles, and thus connecting the central pith with the circumferential cellular envelope, are the medullary rays, or "silver grain."

In both wood and bast, three main constituents are typically present—first, cells little modified from the ordinary shape, and termed *parenchyma;* secondly, cells greatly elongated, and having their walls considerably thickened, these being termed *fibers* or *prosenchyma;* thirdly, vessels or cell-fusions, formed by the union of longitudinal rows of cells. Wood-vessels are known as dotted, spiral, annular, etc., according to the mode in which their thickening is deposited.

Wood is not only valuable as timber (q.v.), but for fuel, being the chief fuel used in many parts of the world. To woody fiber we are indebted also for great part of our cordage and textile fabrics, including the very finest of them, as muslin and lace. Reduced to pulp, it is used for the manufacture of paper.

A kind of factitious or artificial wood, used for making ornamented articles, has recently been invented in France. It is called *bois duré*. It is formed of sawdust, heated to a high temperature, and subjected to very great pressure. Its compactness and hardness exceed those of wood itself. Another kind is made by mixing blood with sawdust, and compressing. Some kinds of costly wood are also imitated by mixing their sawdust with glue, and casting the mixture into the desired shape.

WOOD'BINE. See HONEYSUCKLE.

WOODBRIDGE, a township in Middlesex co., N. J., on Staten Island sound, and the Pennsylvania and other railroads; 3 m. n. of Perth Amboy. It has a high school, the Barron public library, Masonic hall, electric railroad, iron foundry, and manufactories of fire-brick, drain pipe, tile, and fertilizers. Pop. '90, 4665.

WOOD'BRIDGE, a market-t. and river-port of Suffolk, on the right bank of the Deben, which here expands into an estuary, 11 m. from the sea, and 8 m. n.e. of Ipswich. Vessels of 120 tons can reach the town. There are a custom-house, a bonding warehouse, and docks, in which ship-building is carried on.

WOODBURY, a co. in w. Iowa, bordering on Nebraska, having the Missouri and Sioux rivers for its w. boundary, drained by the Little Sioux and other rivers; 800 sq. m.; pop. '90, 55,632. Co. seat, Sioux City.

WOODBURY, DANIEL PHINEAS, 1812–64; b. N. H.; graduated at West Point, 1836; was commissioned in the artillery, and was soon transferred to the engineer corps. He was employed in constructing fortifications in the west and at Tortugas and Key West. In 1861 he did valuable service in fortifying Washington and in the engineering works of the Potomac army; and later in the war was in great part superintendent of the engineering operations against Yorktown and Richmond. He was made brig.-gen. for gallantry in throwing bridges across the Rappahannock in face of the enemy. In 1863 he was made commandant of Key West and there died from yellow fever.

WOODBURY, ISAAC BAKER, 1819–58; b. Mass.; studied music, became a well-known composer, and compiled the *Anthem, Dulcimer, Cythara*, and the *New Lute of Zion*, all collections of church music. He was for some years editor of the *Musical Review* and the *Musical Pioneer*, both published in New York.

WOODBURY, LEVI, 1789–1851; b. N. H.; graduated at Dartmouth college, 1809, and was called to the bar in 1812. For the next 4 years he practiced his profession at Francestown, N. H. In 1816 he was elected clerk of the state senate, and near the close of the year he received an appointment as judge of the state superior court. He settled in Portsmouth in 1819, was elected governor of the state in 1823, and in 1825 was speaker of the lower house of the legislature. The same year he was elected a U. S. senator. At

the expiration of his term, Jackson called him to the cabinet as secretary of the navy. He was transferred to the treasury department in 1834, and remained there till the whigs came into power in 1841. In that year he was again elected to the U. S. senate, from which he resigned in 1845, to accept the place of an associate justice of the U.S. supreme court, succeeding Joseph Story. His *Political, Judicial, and Literary Writings* were published in 1852. He was among the ablest democratic statesmen.

WOODBURY PROCESS. See POSITIVE PRINTING.

WOOD-CARVING is probably the oldest branch of art. Apparently the first weapon was a club, and the first attempt at decoration was some scratching or carving on it. Among the Egyptians, Greeks, and Romans it was much practiced. As a branch of Christian art it was one of the earliest, and attained a high development in the 15th century. It greatly declined during the last century, but has again revived, and promises to attain great importance. The wood-carvers of Great Britain have shown great capabilities, but hitherto have lavished too much care upon fineness of finish rather than on the artistic excellence of their designs.

WOOD-CHARCOAL is the most important, although not the purest, kind of charcoal. Wood consists of carbon, hydrogen, and oxygen, the last two being in the proportion to form water. When heated in the open air, it burns completely away, with the exception of a small white ash; but if the supply of air be limited, only the more volatile matters burn away, and most of the carbon remains. This is the principle of the process of charcoal burning in countries where wood is abundant, as, for example, in the Harz mountains. "A number of billets of wood are built up vertically in two or three rows into a large conical heap, which is covered over with turf or moistened charcoal-ash, holes being left at the bottom for the air to get in. A hollow space is also left in the middle of the heap, to serve as a flue for the gaseous matters which are evolved. The heap is set on fire by throwing burning pieces of wood into the central opening, near the top of which, however, a kind of grate, made of billets of wood, is placed, to prevent the burning fuel from falling at once to the bottom. The combustion then proceeds gradually from the top to the bottom, and from the center to the outside of the heap; and as the central portions burn away, fresh wood is continually thrown in at the top, so as to keep the heap quite full. The appearance of the smoke shows how the combustion is proceeding: when it is going on properly, the smoke is thick and white; if it becomes thin, and especially if a blue flame appears, it is a sign that the wood is burning away too fast, and the combustion must then be checked, by partially stopping up the holes at the bottom, or by heaping fresh ashes on the top and sides, and pressing them down well, so as to diminish the draught. As soon as the combustion is completed, the heap is completely covered with turf or ashes, and left to cool for two or three days. It is then taken to pieces, and the portions still hot are cooled by throwing water or sand upon them: 100 parts of wood yield on the average from 61 to 65 parts by measure, or 24 parts by weight of charcoal."—Watts's *Dictionary of Chemistry*, vol. i. p. 759. The charcoal thus prepared is the best suited for fuel. In England, a large quantity of charcoal is obtained in the dry distillation of wood in cast-iron cylinders, for the preparation of crude acetic acid. The charcoal thus prepared is preferable for making gunpowder, but is inferior for other purposes. A peculiar kind of charcoal of a reddish-brown color, and hence termed *charbon roux*, is prepared in France for the manufacture of the gunpowder used for sporting purposes, by subjecting wood in iron cylinders to the action of superheated steam under a pressure of two atmospheres. Powder made with this charcoal absorbs moisture more rapidly than ordinary gunpowder.

The general properties of wood-charcoal are, that it is black and brittle, and retains the form of the wood from which it was derived; it is insoluble in water, infusible and non-volatile in the most intense heat; its power of condensing gases is noticed in the article on that subject; and from its power of destroying bad smells, it has been regarded as possessing considerable antiseptic properties. It is frequently stated that charcoal is a bad conductor of heat, but a good conductor of electricity; these properties depend upon the nature of the charcoal, the lighter wood, such as willow, yielding a porous charcoal, with little power of conducting heat or electricity; while boxwood yields a very compact charcoal, which is a good conductor of heat and electricity, and is admirably adapted for the exhibition of the electric light. Charcoal never consists entirely of pure carbon, the degree of purity varying directly with the temperature; thus, charcoal charred at 480° contains 65 per cent of carbon, while that charred at 750° contains 80, and that charred at 2,730° contains 96; but the loss of charcoal occasioned by these high temperatures is very great, the three percentages of charcoal corresponding to these temperatures being 50, 20, and 15.

The uses of wood-charcoal are numerous and extensive. It is very largely employed as a fuel, taking the same place in many countries that coal occupies here. From its being proof against all ordinary chemical agencies, "a superficial charring is frequently resorted to, with the view to protect wood from decay, as in the case of piles which are driven into mud or into the beds of rivers to serve as foundations. For the same reason, it is a common practice to char the interior of tubs and casks destined to hold liquids."—Miller's *Inorganic Chemistry*, 3d ed. p. 77. In a finely-divided state, it is com

monly regarded, as has been already stated, as an antiseptic; and there is no doubt that the offensive effluvia from animal matter in an advanced stage of putrefaction disappear when the putrefying substance is covered with a layer of charcoal; but in reality the decay goes on, without the emission of any odor, till at length the whole of the carbon is dissipated as carbonic acid gas, and the hydrogen as water, while the nitrogen remains as nitric acid. For these explanations we are indebted to Dr. Stenhouse, who has shown that the action consists in a rapid process of oxidation, dependent upon the power which finely-divided charcoal possesses of condensing oxygen. In a finely-divided state, charcoal not only condenses gases to a marvelous extent, but has the power of absorbing coloring matters, bitter principles, etc.; and hence it is of extensive use in the laboratory. From the rapidity of its absorbing action, "Stenhouse has proposed to use a respirator filled with charcoal to protect the mouth and nostrils in an infected atmosphere; and the employment of trays of powdered wood-charcoal in dissecting-rooms, in the wards of hospitals, and in situations where putrescent animal matter is present, is found to exert a most beneficial influence in sweetening the atmosphere, by absorbing and decomposing the offensive gases. These properties render charcoal a valuable material in the construction of filters, not only for decolorizing purposes, but likewise for assisting in purifying water for domestic use. It is now also employed most successfully to prevent the escape of noxious vapors at the ventilating openings of the sewers, as it allows the free passage of air, but condenses the offensive effluvia in its pores, where they are destroyed by a process of oxidation.—Miller, *op. cit.* p. 78. Besides its employment in the manufacture of gunpowder, it has many applications in the arts. In medicine, it is at present chiefly used to destroy fetor; for which purpose it is applied in the form of powder or poultice to gangrenous sores, phagedenic ulcers, etc.; it is also largely employed in tooth-powders, as by its mechanical action it removes incrustations, while by its chemical action it destroys fetor of the breath. In indigestion, accompanied by much flatulence, it may be given in doses of two or three teaspoonfuls suspended in water, or may be administered in the form of charcoal-biscuits. Very finely divided poplar charcoal is regarded as the best for medicinal uses.

WOOD'CHAT, *Lanius rutilus*, a bird which, notwithstanding its name, is not a species of chat, but of shrike (q.v.). Its whole length is about 7½ inches. The upper parts are mostly black, the under parts white; but there is a white spot on the wing when closed, and other small portions of the wing-feathers are white, as well as the outer tail-feathers, and there is a narrow streak of white above the base of the bill on each side; the crown of the head and nape of the neck are rich chestnut red. The woodchat is a rare bird in Britain, but is abundant in the southern parts of Europe. It may be regarded as an African bird, being found from the Mediterranean to the cape of Good Hope. In Europe it appears only as a summer visitant, but in Africa it occurs at all seasons of the year.

WOOD'CHUCK, *Arctomys monax*, a species of marmot (q.v.), inhabiting North America, from Hudson's Bay to South Carolina. It is from 15 to 18 in. long, blackish or grizzled above, chestnut-red below; the form thick, the head broad and flat, with almost no apparent neck, the legs short and thick, the feet large, the tail bushy. The hair is rather soft, the whiskers long and stout. This animal digs deep holes in fields, on the sides of hills, or under rocks in woods; its burrow slants upward, so that water may not enter, and within are several compartments. It passes the winter in the burrow, in a lethargic state. The food of the woodchuck is vegetable, and it is particularly destructive to crops of red clover. It is easily tamed, and may be fed on bread, milk, and vegetables. It fights successfully with a dog of equal size. The name of ground-hog is sometimes popularly given to it. Its flesh is sometimes eaten, but is rank.

WOOD'COCK, the popular name of certain birds commonly regarded as of the same genus with the snipes (q.v.), but of more bulky form than the true snipes, and having shorter and stronger legs. The Common Woodcock (*scolopax rusticola*), well known as a game-bird in Britain, and highly esteemed as a delicacy for the table, is found also in all parts of Europe and the n. of Asia. It is one of the birds of Japan. It is only a winter visitant of most parts of Britain, very rarely breeding in England, but it more frequently breeds in the northern parts of Scotland. Its summer haunts are chiefly the pine-forests of the northern parts of Europe and Asia; but in summer it inhabits higher and drier ground than in winter, when it is chiefly to be found in moist woods and swamps, seeking for worms, snails, and slugs as food, boring with its long bill in the soft ground. The quantity of food which it devours is very great; a single woodcock has been known to consume in a night more earth-worms than half filled a garden-pot of moderate size. The woodcock is about 13 in. in length; the upper parts varied with ruddy, yellowish, and ash color, finely intermingled, and marked by large black spots, the lower parts yellowish-red, with brown zigzag lines; the quills striped with red and black on the outer edge; the tail-feathers tipped with gray above and white below. The female is rather stouter and larger than the male, and sometimes attains a weight of 14 or 15 ounces. A woodcock of 27 ounces is on record. The woodcock makes its nest in warm, dry situations, on the ground, of dead leaves loosely laid together. It lays only three or four eggs of a pale yellowish or reddish-brown color. As woodcocks usually breed in very dry situations in the recesses of thick woods, the young ones would be

left to starve but for the peculiar adaptation which enables the parent to transport them to moist feeding-grounds. It was long believed that the female woodcock used only her feet for carrying her young from place to place; but Mr. Charles St. John, in his *Natural History and Sport in Moray*, says, that from close observation he found "the old woodcock carries her young, even when larger than a snipe, not in her claws, which seem quite incapable of holding up any weight, but by clasping the little bird tightly between her thighs, and so holding it tight toward her own body." The woodcock feeds chiefly by night. Great numbers sometimes appear in some parts of Britain, in their migrations. Besides falling to the gun of the sportsman, they are sometimes caught by nets placed in the tracks or open glades in woods, by which they proceed from their retreats to their feeding-grounds, and by nooses or springs set about the places which they frequent.—The AMERICAN WOODCOCK (*scolopax* or *philohela minor*) is a smaller bird than the woodcock of Europe, being only about 11 in. long; very similar in plumage and habits. Three transverse black bands mark the hinder part of the head. It is found in all parts of North America. See illus., OSTRICH, ETC., vol. XI.

WOOD DUCK, or SUMMER DUCK, the *aix sponsa*, one of the most beautiful members of the duck family (*anatidæ*). It is about 20 in. in length; bill shorter than head, high at the base, nail very large and hooked, lamellæ broad and distant, nostrils large and open; tail truncate at tip; head green, glossed with purple; jugulum and sides of tail purple; under parts white; sides yellowish, banded with black; primaries silver white at the tips. It ranges over most of North America, being permanent in the warmer regions, but only visiting the northern parts in summer, whence often called "summer duck." It usually builds its nest in a hollow tree, whence its name "wood duck." It frequents deep, muddy, solitary creeks and ponds in the interior. It usually lives in pairs, and there is rarely more than three or four in a flock (Wilson). It feeds on acorns, wild seeds, and insects. Its flesh is much like that of the "red-head" duck.

WOODEN WEDDING. See WEDDING ANNIVERSARIES.

WOOD-ENGRAVING, OR **XYLOGRAPHY**, the art of engraving designs on wood, differs from copper and steel plate engraving by having the parts intended to print on the paper, in *relief*. While *plates* are printed from the engraved lines by a laborious and necessarily slow process (see ENGRAVING), wood-engravings, having the object to be represented on the surface, in the manner of a type, may be printed along with the matter it is intended to illustrate in the ordinary printing-machine. This, of course, is an important point in the illustration of books, on the grounds of cheapness and expedition. Another advantage wood-engravings possess is, that they can be multiplied to any extent by means of the stereotyping (q.v.) and electrotyping (q.v.) processes.

The invention of wood-engraving, like that of gunpowder, has been claimed for the Chinese, whose books have certainly been printed from engraved wood-blocks for ages. It has indeed been asserted that the art of cutting figures in relief, and printing impressions on them on paper, was known and practiced by that nation as early as the reign of the renowned emperor Wu-Wang (1120 B.C.). There is no doubt that wood-stamps were used by the ancient Egyptians and Romans for stamping bricks and other articles of clay; and that wood and metal stamps of monograms, etc., were used in various European countries, for attesting deeds and other documents, at a very early period, when the ability to write was an extraordinary accomplishment even for princes. It is not, however, until the beginning of the 15th c. that we find any evidence of the existence of wood-engraving, as we now understand it. It appears to have been used in Germany at that time for printing playing-cards and figures of saints. The earliest print of which any certain information can be obtained is in the collection of earl Spencer. It was discovered in one of the most ancient convents of Germany—the Chartreuse of Buxheim, near Memmingen in Bavaria—pasted within the cover of a Latin MS.; it represents St. Christopher carrying the infant Saviour across the sea, and is dated 1423. It is a work of some merit, notwithstanding its apparent roughness; the infant Saviour and the drapery of the saint being drawn with considerable skill and vigor. The inscription at the bottom has been thus translated: "In whichever day thou seest the likeness of St. Christopher, in that same day thou wilt, at least, from death no evil blow incur—1423." Shortly afterward, a series of books, printed entirely from wood-engravings, called block-books, were issued. They consisted principally of religious subjects, with short descriptions engraved on the same block. The most important of them were the *Apocalypsis, seu Historia Sancti Johannis;* the *Historia Virginis ex Cantico Canticorum;* and the *Biblia Pauperum*, the last containing representations of some of the principal passages of the Old and New Testaments, with explanatory texts. The illustrations, of which Mr. Jackson, in his treatise on the *History and Practice of Wood-engraving*, gives an elaborate account and several specimens, seem to be drawn with a supreme contempt for perspective and proportion, but bear evidence of the draperies, and hands and faces, having been carefully studied. One of the cuts in the *Apocalypsis* represents St. John preaching to three men and a woman, with the inscription, *Conversi ab idolis, per predicationem beati Johannis Drusiana et ceteri* (By the preaching of St. John, Drusiana and others are withdrawn from their idols). One figure in the *Biblia Pauperum*, is curious as showing the general manner of representing the creation of Eve during the 15th c., the same subject frequently occurring previous to 1500. It has the appearance of a careful drawing "spoiled in the engraving." Previous to the invention of movable types, whole books

of text were also engraved on wood, and the impressions had evidently been taken by *rubbing* on the back of the paper, instead of steady pressure, as in the printing-press, the ink used being some kind of distemper color.

The Psalter printed by Faust and Schöffer at Mentz in 1457 (see GUTENBERG) is illustrated with initial letters engraved on wood, and printed in two colors, blue and red, which Mr. Jackson considers "the most beautiful specimens of this kind of ornament which the united efforts of the wood-engraver and the pressman have produced. They have been imitated in modern times, but not excelled." It is worthy of note, that although printed upward of 400 years ago, the freshness and purity of the colors remain unimpaired.

As printing spread, the publication of illustrated books became general in Germany and Italy, and reached England in 1476; in which year Caxton (q.v.) published the second edition of the *Game and Playe of the Chesse*, with figures of the different pieces. They are very rude, compared with the earlier German works. An engraving known as the "Knight," is interesting as one of the first wood-engravings executed in this country; several works followed, all, however, in the same rude manner. The first attempt at something finer than simple lines appears in the frontispiece to the Latin edition of Breydenbach's *Travels*, printed at Mentz by Erhard Reuwich, 1486. It is by an unknown artist, and is an elaborate and really very beautiful specimen of the art. It is also remarkable as being the first engraving introducing *cross-hatching* to represent dark shadows. The *Hypnerotomachia Poliphili*, printed at Venice by Aldus, in 1499, is worthy of mention for the extreme beauty of the designs, which have been ascribed by some authorities to Raphael, and by others to Mantegna. About the beginning of the 16th c., a complete revolution in the art of wood-engraving was accomplished by the genius of Albert Dürer. His productions exhibit not only correct drawing, but a knowledge of composition and light and shade, and attention to the rules of perspective, which, with the judicious introduction of subordinate objects, elevated them to the rank of finished pictures. Dürer, however, in common with most of the German artists of his day, paid very little attention to the propriety of costume in his religious subjects; one of his drawings in the *History of the Virgin* (1511), for instance, representing the birth of the Virgin, shows the interior of a German burgomaster's house of his own day, with a number of gossips drinking from flagons, and otherwise enjoying themselves. There has been considerable discussion as to the probability of Dürer having also *engraved* his drawings. Most of the best authorities on the subject, including Bartsch, Jackson, and Firmin Didot, agree in the negative. Mr. Jackson, who speaks with the experience of a practical engraver, says: "In most of the wood-cuts supposed to have been engraved by Albert Dürer, we find cross-hatching freely introduced; the readiest mode of producing effect to an artist drawing on wood with a pen or a black-lead pencil, but which, to the wood-engraver, is attended with considerable labor. Had Albert Dürer engraved his own designs, I am inclined to think that he would have endeavored to attain his object by means which were easier of execution." The reader is referred to the article DÜRER for an account of some of his numerous works. The best of Dürer's contemporary artists on wood were the painters, Hans Burgkmair (q.v.), Lucas Cranach (q.v.), and Hans Schäufflein. A series of works projected by the emperor Maximilian, including *The Adventures of Sir Theurdank, The Wise King, The Triumphs of Maximilian*, etc., were illustrated by these artists; but they are not equal to those of Dürer.

During the first half of the 16th c., the publication of books illustrated with wood-engravings still increased, and prevailed to a greater extent than at any other time, with the exception of the present day. The superiority of talent, both in drawing and engraving, however, still remained with the Germans. In France, although their figure-subjects were inferior to those of their German neighbors, their ornamental borders in prayer-books, etc., of which a great number were printed at this time, were extremely beautiful. In Italy and England the art was very far behind. The most remarkable work published at this time was the *Dance of Death* (q.v.), issued at Lyons, 1538. The original edition of this curious work contained 41 engravings, representing the struggle between Death, generally in the form of a skeleton, and different individuals, such as the pope, the emperor, a judge, monk, doctor, duchess, old man, etc. The drawings, which are characterized by great vigor and skill, are generally understood to have been executed by Hans Holbein (q.v.); but whether he also engraved them, as has been alleged, is more than doubtful. Towards the conclusion of the century, however, the art had made considerable progress in Italy, where some of the best productions of Germany were equaled, if not excelled. In England, it did not make much progress. John Daye published almost the only illustrated books of the time, notably queen Elizabeth's prayer-book, which contains a tolerably well-executed portrait of her majesty. There is no certain knowledge about any of the artists or engravers, although John Daye is supposed to have engraved some of his cuts himself. At this time also, the practice of printing wood-engravings in colors from different blocks became somewhat common, although the attention of artists in that line was mostly confined to ornamental subjects. From the beginning of the 17th c., the decline of wood-engraving may be dated; Germany, the cradle of the art, being the first to forsake it; the only works worthy of notice were a series of blocks on various subjects—designed by Rubens, and engraved by Christopher Jegher of Antwerp, one of the best wood-engravers of that

period—some of which are of great beauty. From this time the art fell into a state great neglect, not, apparently, for want of engravers, for wood-cuts of a certain kind were always produced, but for want of artists able, or willing, to make drawings worthy of preservation.

Nothing particularly deserving of notice occurred until 1766, when John Michael Papillon, an enthusiastic professor of the art in France, published an elaborate history of the subject in an unsuccessful attempt to restore it to its former importance. But it was not until the genius of Thomas Bewick (q.v.) was brought to bear on it, that wood-engraving received that impetus which has made it what it now is—one of the most important of the illustrative arts. Bewick's most important works are his *Histories of British Quadrupeds* (1790) and *British Birds* (1804); all the quadrupeds, and almost all the birds were drawn and engraved by himself. The birds especially are executed with a truthfulness and skill which has rarely ever been equaled. These works are also famous for their collection of tail-pieces, which display an infinite amount of humor and pathos. One of them—a poor ewe, in the starvation of winter, picking at an old broom in front of a ruined cot—represents a scene, trifling as it seems, which tells a woful tale of suffering. He entirely abandoned the elaborate system of "cross-hatching" which prevailed so much in the works of the older engravers, and produced his light and shade by the simplest possible means.

Since Bewick's time, wood-engraving has continued to flourish without interruption. He left behind him several pupils, the most successful of whom were Nesbet, Clennell (who engraved some of the tailpieces in the *British Birds*), and William Harvey. Harvey, however, forsook the burin for the pencil; and his drawings illustrating Milton's *Paradise Lost*, Thomson's *Seasons*, etc., especially such as were engraved by John Thomson (perhaps the most skillful engraver that ever lived, and a pupil of Robert Branston, a self-taught engraver), still retain a first-class place as specimens of wood-engraving. The establishment of the *Illustrated London News* (1842) tended greatly to familiarize the public with the beauties of wood-engraving. In the pages of that periodical appeared the first drawings on wood of Messrs. John Gilbert and Birket Foster. The spirited figure-subjects of the former, and the exquisite landscapes of the latter, have done much to raise the art to the very high place it now occupies in England.

Of late years, the art has also made very great progress in France and Germany. The style of engraving, however, is quite different from the English, so much so, that a practiced eye can distinguish a French wood-cut at a single glance. The professors of the arts of drawing and engraving on wood at the present day are so numerous, and their works generally so well known, that it would be needless, even if our space permitted, to attempt even to enumerate them.

Practice of Wood-engraving.—The wood used for engraving is boxwood, which has the closest grain of any wood hitherto discovered. It is principally imported from Turkey for the purpose, as the English box is too small to be of much use. It is cut *across* the grain in slices, which are dressed to the same height as type, for convenience in printing. Inferior kinds of wood, such as American rock maple, pear tree, plane-tree, etc., are used for coarser purposes; and for very large and coarse subjects, such as posting-bills, common deal is used, and cut on the *side* of the wood with chisels and gouges. When *blocks*—as the pieces of wood are termed—are required of a larger size than a few inches square, it is necessary to join two or more pieces together, as the amount of *sound* wood to be got out of even a large slice is extremely limited. There is, however, for all practical purposes, no limit to the joining process, as blocks have been printed consisting of from 50 to 100 pieces. The wood having been made very smooth on the surface, and squared to the required size, is prepared for the artist by being covered with a preparation of white (commonly water-color Chinese white); this gives a very good surface for the pencil to work on. The subject is then drawn in the ordinary way, the tints being generally washed in with India-ink, and the details filled in with pencil. When the drawing is finished, it is given to the engraver, who, previous to commencing, carefully covers the block with paper, fastened round the edges with beeswax; this is necessary to avoid rubbing the drawing out in the process. As the engraving proceeds, he gradually tears the paper off.

The tools or gravers necessary in wood-engraving are of three kinds—viz., gravers proper; tint-tools; and scoopers, or cutting-out tools for clearing out the larger pieces. They are arranged in different sizes, to suit the different portions of the work. Most engravers use a glass of slight magnifying power, more for the purpose of relieving the eyes from the strain of fixing both eyes closely on a small object, than for magnifying the work. When gas or other artificial light is used, a glass globe filled with water, slightly tinted with blue (to neutralize the reddish glare of the light), is placed between the flame and the work; this serves the double purpose of concentrating the light on the block, and keeping it out of the eyes. When the drawing is in outline, or mostly so, the engraving is very simple; the process consists of engraving a line along each side of the pencil lines, which are, of course, to be left in relief, and afterward cutting out the pieces between. It will thus be understood that every part of a woodcut which prints on the paper is the surface of the wood left untouched, and that every white part is cut or hollowed out. When it is complicated with much shading, trees, etc., it becomes much more difficult, and brings into play the artistic talents of the engraver to preserve

the proper shades, or *color*, as it is technically termed, and texture of the different objects. Some engravers of the present day are celebrated for their power of producing beautiful pictures altogether by "graver-work" from drawings made entirely with the brush. Skies and flat tints are engraved with tint-tools which, from their shape, are best adapted for cutting straight lines; and by the judicious use of the different sizes, the lines are left wider or closer, thicker or thinner, as the tint is wanted darker or lighter. As already mentioned, the tools are arranged in sizes—i.e., those for light tints are broader at the points than those for dark tints, so as to cut out more white. Trees, foregrounds, etc., are cut with *gravers*, which, as they are like a lozenge in shape, give more scope for freedom of handling.

When the drawing is all engraved, a proof is taken by inking the surface gently with printing-ink on a dabber (a ball of cotton covered with silk), and, a piece of *India-paper* being laid on it, by rubbing the paper with an instrument called a *burnisher*, until it is all printed. The engraver then sees what touching up is required—a light part to be softened here, a hard dark part to be toned down there, etc.—before it is finished and ready for the printer.

When large blocks are to be engraved, the pieces of wood are joined with screw-bolts, and the drawing prepared in the usual manner: after which the pieces can be taken separate for convenience in engraving, and also for the purpose of getting it quicker finished, by having an engraver working at each piece.

Wood-engraving, however, is at the best but a slow process, and it is not improbable that before many years it will become a practically lost art. The introduction of mechanical and photographic processes for reproducing drawings has become so general, and reproductions of this kind are so superior to what can be accomplished by wood-engraving, that very little of the latter is seen at present. The cost of mechanical processes is also trifling compared to wood engravings. Many processes have been invented for this purpose. Two of them which deserve mention are the *graphotype process* (q.v.), and *Leitch's process*. In the former, the drawing is made on finely-prepared chalk, with silica; this hardens the lines drawn, and the soft parts are rubbed out with a brush, leaving the lines in relief. From this a stereotype is taken. In Leitch's process, the drawing is transferred to stone like an ordinary lithograph (q.v.), and a proof—printed in ink capable of resisting acid—transferred to a plate of rolled zinc, and the white parts bitten out. The drawing may also be photographed directly on the zinc. This process has been extensively applied to the reproduction of maps, etc. Compare articles Photograph and Photographic Processes.

See Jackson and Chatto's *History and Practice of Wood-engraving* (new ed., Lond. 1861); Papillon's *Traité de la Gravure en Bois* (Paris, 1766); Bartsch's *Peintre-graveur;* Ottley's *Inquiry into the History of Engraving on Copper and Wood;* Firmin Didot, *Essai sur l'Histoire de la gravure sur Bois* (1863).

Wood-engraving in the U. S. is dated from the year 1794, when Alexander Anderson (1775–1870), b. New York, an engraver on copper and type-metal, was stimulated by the sight of some of Bewick's work to experiment on wood. Many reprints of English books during the early part of this century contain his work in the line of reproductions, and the publications of the American Tract soc. may be mentioned among the many to which he contributed original work. Among his pupils was Garret Lansing, of Albany, who produced his first engraving about 1812, and eventually settled in Boston as engraver and printer. Alexander Adams (b. New Germantown, N. J., 1803) came to New York, 1824, as a journeyman printer; took up wood-engraving without an instructor; was encouraged by Anderson, and attained success. The plates in Harper's *Illustrated Bible* (1843) are considered fine specimens of his workmanship. John W. Barber, b. Windsor, Ct., 1798, settled in New Haven in 1823, and engraved the rude but faithful illustrations in his well-known histories of Connecticut, New England, etc. There was so little demand for anything besides cuts for newspapers and handbills, that as late as 1838, according to Linton, there were but five wood-engravers in the country; and the first work of any value, says Woodberry's *History of Wood-Engraving*, was done in 1834 by Anderson. In Linton's estimation, the edition of Irving's *Sketch Book* (1852), and the *Life of Napoleon Bonaparte* (1855), both published in New York, were the best illustrated books (with original cuts) that had yet appeared in America. The American Tract soc. about this time did much to advance the art by improving the quality of the engravings in its books and papers, but the work of Herrick, Whitney, Childs, and others, however true to English traditions, was monotonously "pretty," and lacked individuality. *Harper's Monthly* (established 1850) and *Harper's Weekly* (established 1857) in their early years relied much on blocks cut abroad, or on coarse reproductions of these, and where original engraving was acknowledged it was that of a few men, Lossing, Barret, and Borthwick, for example. The many periodicals and papers that arose in imitation made little, if any, attempt at improvement. In 1862 Harris' *Insects Injurious to Vegetation* was published, and the engravings it contained, by Henry Marsh, scarcely distinguishable from copper-plate work, marked a decided change in method and artistic feeling. The increasing demand for finely illustrated books compelled engravers to keep pace with designs, and in the publications of

Ticknor & Fields, J. R. Osgood & Co., Scribner & Co., D. Appleton & Co., and other leading houses, the progress of wood-engraving, 1860–70, may be more satisfactorily traced, probably, than in our magazines and newspapers—the manual labor and supervision of Messrs. A. V. S. Anthony (q.v.) and W. J. Linton (q.v.) being especially worthy of note. The editors of *Scribner's Monthly* (established 1871) gave great encouragement to the profession by offering prizes to non-professionals, by liberal expenditures, and by bold experiments in the face of traditions. A "new school" arose, fostered by this magazine, and particularly by its successor, *The Century*, and in their pages the failures and brilliant successes of its disciples are conspicuously displayed. The characteristics of the new school, in the words of one of its defenders, are "originality of style, individuality, and chiefly faithfulness in the reproduction of a wide range of subjects by diverse methods—the development of originality in the engraver without damage to the personality of the artist. It attempts to combine the distinctive qualities of a good photograph with those of an engraving; to reproduce as far as possible all the idiosyncracies of an original while securing a work of art valuable for its own artistic sake." This "imitative" process is flatly opposed to the old methods of cutting in fac-simile (as seen in Holbein's work), and white-line independent engraving (as practiced by Bewick), which are, in the opinion of Linton (the most able representative of the old school in this country), the only legitimate ones. "The most striking portion of recent engraving," says Woodberry (*History of Wood-Engraving*, New York, 1883) "is characterized either by a great refinement of line or a practical abandonment of it." There is "a disregard of substance, shape, and material; a neglect of relief and perspective; a crowding the ground with meaningless lines, undirected, misdirected, or uselessly refined; an attempt at an effect by an arrangement of color almost independent of form; the attempt being to make a momentary impression on the eye, instead of to give lasting pleasure through the artistic sense." Hamerton, in his *Graphic Arts*, admits that the Americans ("the best printers in the world") have formed a school of engravers "superior to all others in delicacy of execution and in manual skill; their two leading qualities being tone and texture." The use of photography in transferring designs to the block, so general with the engravers of the new school, though not original with them, is defended on the ground that it enables the artist to work freely in any manner and with any medium he chooses, and that many masterpieces of art can in this way alone be reproduced in popular form. The leading names of this school are Cole, Muller, Closson, Speer, Juengling, and Kingsley. See Linton's partizan but valuable *History of Wood-Engraving in America* (Boston, 1882); Lossing's *Memorial* of Dr. Anderson; Dunlap's *Arts of Design in the U. S.*; and many articles in *Scribner's* and *The Century* magazines.

WOODFORD, a co. in central Illinois, bounded on the w. by the Illinois river and Peoria lake; drained by Mackinaw and Crow creeks, 540 sq.m.; pop. '90, 21,429, chiefly of American birth. Co. seat, Metamora.

WOODFORD, a co. in central Kentucky, having the Kentucky river for its w. and s.w. boundary, drained by the s. fork of Elkhorn creek; 247 sq.m.; pop. '90, 12,380. Co. seat, Versailles.

WOODFORD, James Russell, d.d.; b. England, 1820; graduated at Pembroke college, Cambridge, 1842, with high honors. He took orders, held livings at Easton and Kempsford, became an honorary canon in Christ-church, Oxford, 1867, was select preacher to the university at Cambridge in 1864, 1867, and 1873, and was consecrated bishop of Ely, 1873. Dr. Woodford published several collections of sermons and lectures. He d. 1885.

WOODFORD, Stewart L., ll.d.; b. N. Y., 1835; graduated at Columbia college, 1854; became a lawyer, and in 1861 was made assistant U.S. district attorney. From 1862 to 1865 he served in the army, reaching the rank of col. and brevet brig.gen. In 1866 he was elected lieut.gov. of New York, but 4 years later was defeated when republican candidate for governor. He was a member of congress, 1872–74; and in 1877 was appointed U. S. district attorney for New York by Pres. Hayes, and in 1881 was re-appointed by Pres. Garfield. He is an excellent speaker on political and financial subjects. He is a trustee of Cornell university. In 1897 he was appointed U. S. minister to Spain.

WOODFORD, William, 1735–80; b. Va. In the French and Indian wars he distinguished himself by gallant conduct. In 1775 he was made col. of a Virginia regiment and had chief command at the victory of Great Bridge. He was present at Brandywine and at the siege of Charlestown, was taken prisoner.

WOODHOUSE, James, M.D., 1770–1809; b. Philadelphia, Pa.; graduated at the University in that city, and in medicine; was surgeon of St. Clair's expedition in 1791; and professor of chemistry in the University of Pennsylvania, 1795–1809. Author of *Experiments and Observations on Vegetation*, etc.

WOODHOUSE, Robert, 1773–1827; b. England; educated at Cambridge, where he was appointed fellow in 1798, prof. of mathematics in 1820, prof. of astronomy and experimental philosophy in 1822, and director of the observatory in 1824. Among his works, which had much influence on mathematical studies are, *Plane and Spherical Trigonometry* (1809), and *A Treatise on Astronomy* (1818–23).

WOODHULL, Nathaniel, 1722–76; b. N. Y.; a soldier in the French war, 1755–63, and col. of a regiment in Amherst's army. He was a member of the N. Y. legislature, 1769–75, and a warm advocate of the patriotic side in the disputes then in progress between the colonists and the mother country. He was president of the N. Y. provincial congress, when the British invaded Long Island, and at once took command of the militia. Soon after the battle of Long Island, he was surprised by some light horse troops, who killed him after he had surrendered.

WOODITE. For years the attention of naval experts has been directed to the discovery of some elastic and buoyant packing material, which, while subject to the penetration of projectiles, would be so elastic as to immediately close the opening made and prevent the inflow of water. Woodite, that has recently appeared in England, is used aboard the war vessels of that country, and is proposed for the men-of-war building in the United States, has a base of India-rubber, from which it is prepared by a process which does not deprive it of its elasticity, and which is said to preserve it from deterioration from fire, water, and all other usual causes of decay. It is now manufactured in two types—the buoyant and the elastic. Buoyant woodite has the appearance of cork chips held together by India-rubber, and, as its name implies, is intended to be used only to supply buoyant properties. It weighs about 14 pounds per cubic foot, and experiments show that about four per cent. of the space it occupies is taken up by water after an immersion of 24 hours.

Elastic woodite is made up in rectangular blocks, is very elastic, and has only obturating qualities claimed for it. It weighs about 64 pounds per cubic foot, and a thickness of one inch is said to be sufficient to stop the inflowing of water from the penetration of 6-pounder projectiles. In some experiments made, blocks 8 inches in thickness were vulcanized to a $\frac{3}{8}$-inch iron plate backed by a second plate of the same thickness, and fired at from a distance of 50 yards by Nordenfeldt 3-pdr. and 6-pdr. rapid-fire guns. Six shots were fired in all, the holes closing up so completely that water with a head of 40 feet failed to find its way through. Very small marks were visible on the woodite where the shots had entered, while large holes had been made in the backing.

WOOD'-LOUSE *Oniscus*, a Linnæan genus of crustacea, now forming the family *oniscidæ*, of the order *isopoda*. The antennæ are four in number, but two of them are very short, consisting of two joints at most; the other two are long and slender. The tail is very short, but is composed of six segments. Wood-lice are terrestrial, and the respiratory organs are completely infolded by plates developed from the abdominal members; the anterior plates being perforated by a row of small holes, through which the air has access to the gills. They frequent damp situations, and are generally found in dark and concealed places, under stones, in holes of walls, under the decaying bark of trees, etc. They feed on decaying animal and vegetable matter. They run with some celerity when apprehensive of danger, and sometimes also roll themselves up into a ball, so as to exhibit only the plates of the back. The eggs are inclosed in a pectoral pouch. See illus., Crustaceans, vol. IV.

WOOD'PECKER, *Picus*, a Linnæan genus of birds, now divided into a number of genera, and belonging to the family *picidæ*, of the order *scansores*. The toes are in pairs, two before and two behind, with sharp strong claws; the bill is rather long, straight, and wedge-shaped, with a hard tip, the tip and sides compressed; the tail is usually lengthened and rigid, although in some it is short and rounded; the vertebræ of the neck are greatly developed, and the last of the caudal vertebræ is very large, with a long ridge-like spinous process; the whole structure adapting these birds to run and climb with the greatest facility on the stems and branches of trees, in which they aid themselves by the tail, like creepers (q.v.), and to seek their food, which consists chiefly of insects and their larvæ, by digging into the bark and wood of trees with their bill. In addition to the particulars already noticed, they have the tongue fitted to serve as an important instrument in obtaining their food; the branches of the hyoid bone being greatly elongated backward, and in front moving as in a sheath; a peculiar arrangement and development of muscles enabling them to extend the tongue far beyond the bill; its tip being horny, and furnished with barbed filaments, while its surface is covered with a glutinous saliva, secreted by two large glands. Their powers of flight are very moderate, and the keel of the breast-bone is small. The barbets (q.v.) and wrynecks (q.v.) are referred to the family *picidæ*. Woodpeckers are diffused over almost all parts of the globe, but abound chiefly in warm countries. The species are very numerous. They are mostly solitary in their habits, and live in the depths of forests. They feed in part on fruits and seeds as well as on insects; but much of their time is spent in pursuit of these, and they may be heard at a considerable distance, tapping the wood of trees with their bills, to discover the place where an insect is lodged, and to get at it when discovered. The common notion, that they are very injurious to trees, is erroneous, as they do more good by preventing the ravages of insects than harm by their pecking. They strike out chips of wood with their strong bill, and in this way enlarge holes in decayed parts of trees for a roosting-place or a nest, carrying away the chips to a distance, especially in the case of a nest, as if for precaution that it may not be discovered. The nest consists of a mere hole in a tree, perhaps with a few chips in the bottom of it, but with no other lining. The plumage of woodpeckers is generally of strongly con

trasted colors, black and white, or green and yellow, with red marks about the head. There are several well-marked groups of wood-peckers, differing in form, plumage, and habits, which also are of different geographic distribution, some of them being entirely, and some chiefly, confined to particular parts of the world.

Only four species are found in Britain, and one of them, the GREAT BLACK WOODPECKER (*picus* or *dryocopus martius*), is of rare occurrence. It is about sixteen inches long; black, with a red cap on the head. It is found in the pine-forests of many parts of Europe.—The GREAT SPOTTED WOODPECKER (*P. major*), also called FRENCH PIE and WOOD PIE, is not uncommon in some parts of England, but is rare in Scotland. It is found on the continent of Europe from Norway to the Mediterranean. It is about nine inches and a half in length. The color is black, varied with white, the under parts grayish-white; the back of the head in the male bright scarlet. The LESSER SPOTTED WOODPECKER (*P. minor*) is not uncommon in the s. of England. Its whole length is about five inches and three-quarters. It is widely distributed in Europe and the n. of Asia. Its colors are similar to those of the last species, but differently arranged. It is frequently to be seen searching for insects on the moss-covered branches of orchard trees.—The most plentiful of all the British species of woodpecker is the GREEN WOODPECKER (*picus* or *gecinus viridis*). It is found in the wooded parts of Scotland as well as in England, but is rare in Ireland. It is common on the continent of Europe from Scandinavia to the furthest south. It is about thirteen inches in length; and is mostly of a dark-green color, tinged with yellow; the feathers over the nostrils and round the eyes black; the crown and back of the head, bright scarlet, a black mustache extending backward and downward from the base of the lower mandible, with a brilliant scarlet patch along the middle of it; the edges and tips of the wings spotted, black and white. It chiefly inhabits elm and ash trees, making its roosting-place and nest in them in the manner already described. Among its popular English names are *woodspite, yaffle, whetile,* and *woodwall.* The green woodpecker belongs to a group or section of woodpeckers entirely confined to the old continent, and which are more frequently to be seen seeking their food on the ground than the more typical species. The American species of woodpecker are very numerous, and some of them, which want of space prevents us from describing, are among the best-known birds of the United States and Canada; as the HAIRY WOODPECKER (*picus villosus*), which is to be found at all seasons in woods, orchards, fields, and even in the midst of cities, visiting farm-yards in winter to pick up grain—a lively, noisy, and active bird; the IVORY-BILLED WOODPECKER (*picus* or *campelophilus principalis*), which inhabits the southern parts of the United States and Mexico: is called *carpentero* by the Spaniards, from the great quantity of chips which it makes; and is valued by the Indians for its ivory-like bill and scarlet crest, which they use as ornaments. The RED-HEADED WOODPECKER (*picus* or *melanerpes erythrocephalus*) is very common in most parts of North America, and feeds much upon fruits and upon young heads of Indian corn, so that a reward is given for killing it. The largest species in the northern parts of America is the BLACK WOODPECKER, or LOG-COCK (*picus* or *dryotomus pileatus*), which is about eighteen inches long, the general color greenish-black, with stripes of white from the eyes along the neck and sides.—The genus *picumnus* is the type of a group of *picidæ* called *piculets,* very small birds, with bill hard at the tip, broad rounded wings, and a short tail with broad rounded feathers, not used for support, departing from the typical characters of the family. They inhabit the warm parts of South America, India, and the eastern archipelago. See illustration, BIRDS, vol. II.; LARKS, ETC., vol. VIII.

WOOD-PRESERVING. Several processes have been employed of late years for the purpose of preventing the decay of wood from damp, atmospheric action, or the destructive operations of animals and parasitic plants. The principle in all has been the same —viz., the injection into the vessels of the wood of some mineral material, which, by combining with the albumen of the woody tissue, prevents its decomposition, or gives it a poisonous character. The chief of the methods in use are that called kyanizing (q.v.), creosoting, in which the preserving material is the so-called creosote, or crude carbolic acid of coal-tar, and the Boucherie process, chiefly used on the continent. In this last a solution of sulphate of copper is used. While the tree is still growing the head of the tree is cut off, and the top of the bare stem is hollowed into the form of a bowl, which is then filled with the solution, which is afterward supplied as required. The liquid penetrates downward, killing the tree as it goes, but giving to the wood a most remarkable degree of durability.

WOOD'RUFF, *Asperula,* a genus of plants of the natural order *rubiaceæ,* containing a number of annual and perennial species, with whorled leaves, natives of the northern parts of the old world, and distinguished by a funnel-shaped or bell-shaped corolla, a bifid style, capitate stigma, and dry didymous fruit. The SWEET WOODRUFF (*A. odorata*) is common in shady woods in Britain and all parts of Europe. It has a creeping root, a stem 5 to 10 in. long, weak and sub-erect, four or five whorls of lanceolate leaves, 6 to 8 in the whorl, rough at the edge and keel, and small white flowers. The plant, when dried, has a very agreeable fragrance, similar to that of *anthoxanthum odoratum* (see VERNAL GRASS) under similar circumstances. It forms an agreeable herb-tea, and enters into the composition of the popular *May-drink* of the Germans.—DYER'S WOOD-

RUFF (*A. tinctoria*) is a native of the continent of Europe and of Siberia, a perennial, with reclining stems about a foot in length, whorls of six or four linear leaves, the upper leaves opposite, the flowers whitish. The root is used in Dalmatia and elsewhere instead of madder; but the crop obtained from a field is inferior in quantity to that of madder.

WOODRUFF, a co. in central Arkansas, having the White river for its w. boundary; drained by the Cache; 577 sq. m.; pop. '90, 14,009, chiefly of American birth, 4483 colored. Co. seat, Augusta.

WOOD-RUSH. See LUZULA.

WOODS, CHARLES R., b. Ohio, 1827; educated at West Point, and appointed to the engineers. He was stationed on the frontier or in garrison till 1861. As col. of an Ohio regiment, he fought through the West Virginia campaign, and was at fort Donelson, Shiloh, the siege of Corinth, and the siege of Vicksburg. He was made brig.-gen. of volunteers in 1863, participated in Sherman's campaign, and was retired from the service in 1874, with the brevet rank of maj.-gen. He d. 1885.

WOODS, LEONARD, D.D., 1774–1854; b. Mass.; graduated Harvard college, 1796; ordained pastor of Congregational church at Newbury, 1798; contributed controversial papers to the *Panoplist*, 1805, in defense of Calvinism; professor of theology, Andover seminary, 1808–46. He was prominent in the formation of the Am. tract society, Am. education society, and the Am. board of foreign missions; was the champion of Calvinism in opposition to Unitarian theology. He published *Letters to Unitarians; Reply to Ware; Letters to Rev. N. W. Taylor; Lectures on Inspiration; Memoirs of American Missionaries; Infant Baptism; Lectures on Church Government; Lectures on Swedenborgianism; Doctrine of Perfection; History of Andover Seminary.* His collected works were published in 5 vols.

WOODS, LEONARD, Jr., D.D., LL.D., 1807–78; b. Mass.; graduated Union college, 1827; ordained 1833; tutor Andover theological seminary, 1831; professor of sacred literature Bangor theological seminary, 1836–39; edited *Literary and Theological Review*, New York, 1834–37; president Bowdoin college, 1839–66; visited Europe in 1867 to obtain materials for a history of Maine. He published *Address on Life and Character of Parker Cleaveland; The opening of the New Hall of the Medical School;* translated Knapp's *Theology*, and De Maister's *General Principles of Political Constitutions.* He was a broad and vigorous thinker, with large learning and literary taste.

WOODSON, a co. in s.e. Kansas, drained by the Neosho river, Owl and Turkey creeks, and the Verdigris river in the s.w.; 504 sq. m.; pop. '90, 9021, chiefly of American birth. Co. seat, Yates Centre.

WOOD-SORREL. See OXALIDEÆ.

WOODSTOCK, a town in Windham co., Conn., consisting of six villages — Woodstock, Woodstock Valley, East, West, North, and South Woodstock; pop. '90, 2309.

WOODSTOCK, a small town and parliamentary borough, Oxfordshire, 8 m. n.w. of the city of Oxford. The pop. (1891) of the borough (which includes several adjacent villages and hamlets) is 7308, and is much larger than that of the town, which contained only 1628 inhabitants. The manufacture of fawn-skin gloves gives employment to many persons, residing in the town and neighboring villages. Woodstock, or rather Old Woodstock, a little to the north of the present town, was a residence of the early English kings; but no remains of the ancient palace exist. Edward, the Black Prince, was born here; Elizabeth was held prisoner by her sister Mary; and Chaucer resided here for some time. Woodstock is also famous in connection with Fair Rosamond, the celebrated mistress of Henry II. It is now doubted, however, if the labyrinth or maze which Henry is said to have constructed for her behoof ever existed. In the immediate vicinity is Blenheim park, the seat of the duke of Marlborough.

WOODSTOCK, town, port of entry, and co. seat of Oxford co., Ontario, Canada; on the Thames river, Cedar creek, and the Grand Trunk and the Canadian Pacific railroads; 30 miles e.n.e. of London. It has a large trade, good waterpower, more than a dozen hotels, several branch banks, about a dozen churches, excellent schools, and manufactories of woolen goods, grist, oat-meal, furniture, organs and pianos, stoves, boots, engines, leather, etc. The town is a favorite summer resort of citizens of the United States, because of the beauty of its scenery. Pop. '91, 8612.

WOOD-SWALLOW, *Artamus*, a genus of birds, resembling swallows in many of their habits, but differing in the structure of their bills and feet, and belonging to the family of *ampelidæ*, or chatterers (q.v.). The bill is very broad at the base, and arched; the upper mandible thick, but not ridged; the gape furnished with bristles; the nostrils wide apart, naked; the feet short and strong; the wings very long and pointed; the tail short. Their flight is rapid. Their food consists chiefly of seeds. They are natives of the East Indies and of Australia. An Australian species (*A. sordidus*) is sometimes seen in great numbers, and is remarkable for the habit of suspending itself in clusters on dead branches, like a swarm of bees, one bird clinging to another.

WOOD, UNINFLAMMABLE. By the use of certain mixtures the tissues and superficial parts of wood can be rendered uninflammable. In 1880 the French soc. for the

encouragement of national industry awarded a prize to M. Martin, of Paris, for his preparations, which were tested by a committee. For all light tissues his preparations consisted of pure sulphate of ammonia (8 kil.), carbonate of ammonia (2.5), boric acid (3), pure borax (2), starch (2), water 100. Another mixture for painted decorations consists of chlorhydrate of ammonia, boric acid, glue, gelatine, water, and lime. These preparations are said to have been used with success at some of the French theatres in cases where fire was simulated upon the stage.

WOODWARD, a tp. in Clearfield co., Penn. Pop. '90, 5596.

WOODWARD, Bernard Bolingbroke, 1816–69; b. England; tutor in a private school; clerk in a banking house; studied theology in the Independent college, Highbury, 1839, 1840; graduated London university, 1841; minister of an Independent church, Wortwell; aided in preparing a new edition of Barclay's *Universal Gazetteer;* settled in London and wrote for the press. He published *History of Wales from the Earliest Times to its Final Incorporation with England; History of the United States of N. America to the end of the Administration of President Polk; First Lessons on the English Reformation; Windsor Castle, Thirty Photographs printed in Permanent Colors with Descriptive Text.*

WOODWARD, Samuel Peckworth, ph.d., 1821–65; b. England; educated at the London university. From 1839 to 1845 he was sub-curator of the London geological society; from 1845 to 1848 professor of botany and geology in the Cirencester agricultural college; and for three years assistant in geology and mineralogy at the British museum. He published many scientific papers, a geological map of England and Wales, and *A Manual of Mollusca, or a Rudimentary Treatise on Recent and Fossil Shells.*

WOODWAXEN. See Wood; Dyers' Broom.

WOODWORTH, Samuel, 1785–1842; b. Mass. He learned the printer's trade, and in 1823 was joint owner with George P. Morris of the *New York Mirror.* He wrote several poems, of which one, the *Old Oaken Bucket,* has gained popular appreciation. In 1861 a collection of his poems was published.

WOOL is a variety of hair (q.v.). The term hair is applied, in ordinary language, to a smooth, straight-surfaced filament like human or horse hair, without serrations of any kind on its surface. Wool, on the other hand, is always more or less waved; besides which, externally each woolly filament is seen under the microscope to be covered with scales overlying each other, and projecting wherever a bend occurs in the fiber. Upon minute points of difference the value of wool chiefly depends, especially with regard to the great variety of its applications. If each fiber were straight and smooth, as in the case of hair, it would not retain the twisted state given to it by spinning, but would rapidly untwist when relieved from the force used in spinning; but the wavy condition causes the fibers to become entangled with each other, and the little projecting points of the scales hook into each other, and hold the fibers in close contact. Moreover, the deeper these scales fit into one another, the closer becomes the structure of the thread, and consequently of the cloth made of it. This gives to wool the quality of *felting* (q.v.). By combing, or drawing the wool through combs with angular metal teeth, some of the scales are removed, and the points of many more are broken off, so that wool which has been combed has less of the felting property, and is consequently better adapted for light fabrics; and yarn made of such wool is called *worsted,* and the cloths made of it *worsted goods.* But such is the variety of wools obtained by careful breeding and selection, that these differences can be got without combing, some wools being found to have naturally fewer serratures, and a less wavy structure, than others. These are consequently kept separate, and are called *combing-wools;* whilst those which are much waved, and have many serratures, are called *carding-wools,* from their being simply prepared for spinning by carding-machines. The serratures or points of the scales are exceedingly small, and require the aid of a good microscope to see them. They vary from 1200 up to 3,000 to an inch.

Wool is the most important of all animal substances used in manufactures, and ranks next to cotton as a raw material for textile fabrics. Its use as a substance for clothing is almost universal in the temperate regions of the globe.

Previous to 1791 British woolen cloths were made almost wholly of native-grown wools. At that time the whole supply of the country could not have much exceeded 100,000,000 lbs. The merino wool of Spain then began to displace them in the best kind of goods, and the imports from that country reached their maximum in 1805, being in that year 7,000,000 lbs. Before 1820 the German wool had begun to supersede the Spanish, and was imported largely till 1841. After that, the cheaper wool of the British colonies to a great extent took the place of the German, and the latter is now chiefly used for only the finest cloths.

Wool varies in character according to the peculiar breed of sheep which yields it, and also with the nature of the soil, food, shelter, and climate. In a wool of first-rate quality, the fibers are fine, soft, elastic, sound, of good color, and free from deleterious or troublesome impurities: the commercial value of any sample depends, therefore, upon the extent to which it possesses these properties. If it be a combing-wool, it will also depend upon its length of staple.

For technical purposes, shorn fleeces are divided into two classes, one called *hogs* or *tegs,* the other *wethers* or *ewes.* The former are the first fleeces shorn from the sheep,

the latter are those of the second and succeeding years; but the meaning of these terms varies a little in different districts. The fleeces of yearlings are, as a rule, longer in the staple, and otherwise of superior quality to the wool of older animals. In the s. of England, it is customary to clip lambs, and the wool so obtained is called *shorn lamb's wool*. Wool taken from the skins of slaughtered sheep is called *skin-wool* or *pelt-wool*, and is of a more variable quality than fleece-wool, on account of its being obtained in all stages of growth.

Some of the British colonies are very important wool-producing countries, Australia in this respect standing far in advance of all other countries whatever. The Australian wool has in general a beautiful, short, silky staple, well adapted for the manufacture of soft, pliable, and elastic fabrics. All the settled districts of this continent have been found well adapted to the growth of fine-wooled sheep, and the extraordinary increase in the flocks forms one of the most remarkable features of the colony.

The wool of Cape Colony has of late years been greatly improved by the introduction of merinos, and the exports from it are increasing very rapidly.

Turning now to European countries, it is somewhat sad to think that Spain, the native country of the merino, which not so long ago sent all the wool for the best English cloths, has allowed its quality to degenerate, and its once large supply to dwindle away. The wool of Saxony, Silesia, and some parts of Austria, which is obtained from sheep of the merino breed, is the finest produced in any country; and notwithstanding the lower price and nearly equal quality of the Australian, German wool is still employed for the finest broadcloths, some kinds of ladies' shawls, and a few other purposes. Great attention is paid to the breeding and rearing of sheep in Germany, and large flocks are reared for their wool alone. In Austria, the number of sheep is estimated at 45,000,000, and the annual yield of wool at 100,000,000 lbs., most of it being of fine quality, and all of which is consumed in Austrian manufactures. France produces a large quantity both of fine and coarse wool. In Italy, the production of wool from mixed merino breeds has become a source of great wealth. Russia, as might be expected from its great extent, rears many qualities, from the finest merino to a very coarse kind. The wools of the remaining countries of Europe are of minor importance.

Independently of the vast amount of home and foreign-grown wool which finds its way into our markets as wool that is in the condition fit for spinning and weaving, considerable quantities are retained on the skins, and made into rugs or mats for house and carriage use. For this purpose skins of the very best qualtity are chosen, and it is necessary that the wool should be very long in the staple. After being carefully curried, the long silky locks of wool are dyed usually some bright color, and combed.

Official statistics show that the production of wool in the U. S. increased from 60,264,913 lbs. in 1859, to 391,487,000 lbs. in 1889, and that the consumption in the same period increased from 65,749,635 lbs. to 388,083,000 lbs. The total number of sheep in the country in 1890 was estimated at 44,326,072, and their value, $110,000,000. Texas was first in both the number and actual value of its sheep; California was second in number, though in actual value the sheep of Ohio exceeded it. The wool of Ohio, indeed, with respect to quality, condition, and length and strength of fibre, is deemed superior to the wool of any other state. An act passed in 1867, March 2, established a classification of wool, for customs duties, into clothing wool, combing wool, and carpet wool; and this classification is maintained by the existing revenue laws. It is based upon distinctions in the characteristics of the wool of the different breeds of sheep, and applies also to hair of the alpaca goat and similar animals. Clothing wool, which is the fleece of sheep of Merino breed, either immediate or remote, is of fine, short fiber, remarkable for its felting quality, and is prepared for spinning by carding rather than combing. The Merino sheep are common in the middle, eastern, and western states, in W. Va., and in Tex. Few sheep of other blood are found w. of the Missouri river. The highest type of the race is found in Vt., in portions of N. Y., O., and Mich., and scattered throughout the western states. Combing wool, which, as the name indicates, is prepared for spinning by combing, includes the coarse, long, and medium wool of English and other breeds popularly known as mutton breeds. Nearly all the sheep of the south, exclusive of Tex. and W. Va., are of this breed, with occasional infusions of better blood from the northern states; and this breed is also scattered through the western states. The carpet wools are represented in the U. S. only by the Mexican sheep found in Col., New Mex., and parts of Ariz. Of the total wool product of the U. S., the proportion of clothing wool, as defined by the tariff, is more than two-thirds of all, and the combing wool comprises most of the remainder, the carpet wool constituting but seven per cent. of the entire product. At present the distinction between clothing and combing wools is somewhat arbitrary, as with the improvements in combing machinery a staple 2½ in. long can be combed with facility, and there is little wool grown e. of the Mississippi river which does not have that length. All grades of wool, from the coarsest to the finest, may be combed. Any wool can be carded, though some of the long, coarse breeds of wool would make trouble with the cards. In 1883, March 3, a tariff act was passed which considerably reduced the duties on raw and manufactured wool. Wool imported, 1887, 114,038,030 lbs.

WOOL, JOHN ELLIS, 1784–1869; b. N. Y., studied law, but in 1812 was appointed capt. in the U. S. army. In the war with Great Britain he distinguished himself at Queenstown heights, where he was wounded, and at Plattsburg. He rose through the various grades, and in 1841 reached the rank of brig.gen. In 1832 he went to Europe, studied military science, and was present at the siege of Antwerp. In the Mexican war he organized 15,000 volunteers, selected the ground for the battle of Buena Vista and was second to Gen. Taylor in command. For his services he was brevetted maj.-gen. He afterward served in the Indian warfare. On the attack on fort Sumter, he reinforced fortress Monroe and prevented its seizure. He was made commander of the department of Virginia, and in 1862 captured the city of Norfolk. In the same year he became a maj.-gen. In 1863 he commanded the department of the east.

WOOLEN AND WORSTED MANUFACTURES. The spinning and weaving of wool into fabrics dates back into a very dim antiquity. At the time of the Macedonian conquest, about 336 years before Christ, the natives of India wore shawls of great beauty. Herodotus speaks of the use of *felt*, an unwoven fabric of wool and fur, agglutinated and matted together with the aid usually of moisture and heat. It was used not only for coverings for the head, but for many domestic purposes, even to the making of table covers, mats for the floor, and was the principal substance of clothing as well as habitations. The following sentence gives a history in itself of its use and benefit. Speaking of the Argippæi, he says: "They live under trees, covering the tree in winter with strong and thick undyed felt, and removing the felt in summer." Woolen felt is also mentioned by the same writer, as a covering for tombs. Felt does not differ much if any in the present day from that manufactured by the ancients, except perhaps in the improved methods of manufacture.

It is evident that fine woolen goods were in use long before the time of Alexander, not only because of the high art exhibited in their manufacture at that time, but in the many allusions both in sacred and profane history in reference to the matter. The Greeks learned many processes of woolen manufacture from the Egyptians; the Romans from the Greeks; and from the Romans the knowledge has generally pervaded the occidental world.

Among the ancients, the method of manufacture was to, after thoroughly cleansing the wool, whether of sheep or goats, or even camel's hair, which was submitted to the same process, sort, card, and spin the material entirely by hand. The loom for the weaving was remarkably simple, even crude, but under the delicate manipulation of dextrous fingers, skilled operators produced fabrics that have never been excelled in fineness of texture or delicacy of construction, even at this later day.

Woolen garments were worn by the Romans at a very early period. Tacitus speaks of a factory whence the Roman army was supplied with woolen clothing. It is very probable that the early lessons our modern ancestors in Britain received in the art were derived immediately after the Roman conquest, and woolen manufacture as carried on in England was at the outset but a repetition, and afterward an elaboration and improvement on the methods previously known. The product of certain looms had such a reputation that the statement was made, "the wool of Britain is often spun so fine that it is in a manner comparable to a spider's thread." It is generally supposed that certain Flemish weavers went to England in the time of William the Conqueror, and obtaining the royal patronage, established the first manufactories of woolen goods. At various periods in the reigns of succeeding monarchs, other Flemish weavers were imported, and established at differents points in the kingdom. Henry II. established guilds of weavers in his reign; and the exclusive privilege of exporting woolen cloth was by him granted to the city of London. In the 13th century, Spain produced her own cloth, and the beauty of her fabrics was celebrated far and wide. Italy followed, and employed processes apparently superior to any in use. It is difficult to tell which country produces the best fabrics at the present day, so great is the competition and the desire to be the first in the battle of manufacture.

Woolen manufactures are divided into two principal divisions, known as *Wool* and *Worsted*. For the first, *carded* wool is used, and the thread is loosely spun, giving a soft and pliable texture. The goods are technically designated as *Woolen Fabrics*. For the second, *combed* wool is used, and the thread is twisted until it becomes very hard. It is technically designated as *Worsted Fabrics*.

Sheep Washing.—The surface of a fleece of wool has almost invariably a thick coating of dirt adhering to it, and in the finer wool breeds of sheep, there are many solid masses of dirt and wool caked together. There is an exudation from the skin of the animal of an oily yolk, or *suint*, which lubricates the wool, and attracts in eminent degree surrounding particles of dust. While it forms a protective covering to the sheep, rendering the fleece impervious to moisture, and preserving the inner coating of wool in a soft, pliant, and silky condition, it must nevertheless be removed before the wool can be properly handled for manufacture. It has been until recently the habit of sheep washers to select a running stream, and securing the sheep in a close pen on the bank, take them singly, and while one man held the victim, a second did the washing. The operation has been deemed objectionable in many localities, owing to the pollution of the water by the dissolving of the potash salts contained in the sticky masses in the wool, and the custom has been generally abandoned. Destruction of fish

life in the streams very frequently resulted, as well as losing the potash salts, so valuable for fertilizing. These considerations resulted in the adoption among many wool growers of sheep-washing appliances. The best is a pen into which the sheep are driven, and subjected to a strong spray of water of proper temperature, which soaks the fleece and softens the dirt. This done, the sheep are obliged to swim in a tank for rinsing purposes, and when they pass out are subjected to a final *douche* of pure water. They are then driven into a clean yard, where, after a few days, they are ready for the shearing or clipping.

Shearing.—A skillful user of the shears sits upon the ground, takes the sheep in his lap or across his knees, and will remove the fleece from the sheep in one unbroken, continuous sheet, retaining the form and relative positions of the mass almost as if the creature had been scientifically skinned. Different operators begin at differents parts of the body, as fancy dictates, but all have the same object in view—viz., the giving an unbroken fleece from the cutting.

Sorting, or *Stapling,* is usually regarded as a distinct industry. It consists in determining the different qualities that shall be mixed for a given quality of cloth. *Carding* wools are separated from and classed differently from *combing* wools, and differing races of sheep are very carefully considered. Generally speaking, the choicest brand of wool is that which comes from the side of the sheep. It is the cleaner in growth and less liable to be affected by accidental circumstances. The upper or back portions are liable to receive and retain a certain amount of impurity in the way of dust and burrs that produces an irregularity in growth; the wool on the rump of the sheep is coarser than the wool on the side; and the wool of the under parts of the body is generally short, worn, and dirty, as compared with the other portions.

The sorter works at a table having a fine wire netting, through which any dust and dirt contained in the wool he is handling may fall, and not be liable to annoy him by a possible subsequent stirring up. He examines each fleece as it is spread out before him, and with marvelous precision and certainty picks out his separate qualities, throwing each lot into its proper receptacle. His labor is sometimes extremely difficult, for, in individual fleeces, qualities and proportions differ in marked degree, and it is only by long experience that a stapler is enabled to rightly divide up his lots so as to produce *even* qualities of raw material.

The grades of wool are given as follows:

Fine and superfine.....Wool taken from near the ear;
Semi-fine.....wool taken from the shoulder;
Medium.....wool taken from the flanks;
Coarse.....wool taken from the upper thigh;
Very coarse.....wool taken from the lower thigh.

The above grades are classified as *high-quality* fleeces. The *low quality* is divided into four grades, in the following order:

First.....Wool taken from the lower belly and forehead;
Second.....wool from the lower parts of the thighs;
Third.....wool from the breech locks;
Fourth.....wool bearing tarry-marks (marks put on the animals for identification).

Beating.—After being sorted, the wool is subjected to a process of beating, not only for the purpose of eliminating dust and other impurities, but the procedure has the effect of disposing the staple to open and thus render the material softer and less resisting when washed and worked over in the various machines. The wool must be thoroughly dry, else many difficulties will be encountered. If the beating process be well carried out, it will not only dispose of many impurities, but will invariably treble and even quadruple the volume of the fibre.

Scouring.—The washing received by the live sheep before the removal of the fleece is not enough for the purposes of the manufacturer. There is a subsequent cleansing which could by no possibility be given while the material was a part of the animal. Soft water is invariably required, because the insoluble lime soap formed in dissolving soap in hard water is deposited on the woolen fibre and becomes inextricably entangled. Wool washed with hard water is always harsh to the touch; it takes on dyes unevenly, and is not readily cleansed. Soft water is therefore an absolute necessity for the production of good fabrics. The wool is immersed in an alkaline lye which forms a soap with the natural grease of the fleece. This acts as a detergent, and cleans the wool most thoroughly.

Drying.—The more gently and uniformly this can be accomplished, the better the result. The wool is spread as evenly as possible over a frame-work of wire netting, with steam pipes underneath. In the later and more approved methods, the wool is entered by continuous feed on one side of a heater chamber; the strength of the blast carries it up and deposits it at the further end, where it passes out well and equally dried. The process consists of a system of circulation through the machine until the drying is complete.

Teasing.—The wool having been dried is still found to retain many objectionable features that were not disposed of in the previous manipulations. There are bunches,

matted locks, dust, sand, and other impurities, all of which must be removed before the article can go toward final manufacture. The process of removing these objectionable features is termed *teasing* or *willying* (the latter term being given in honor of the inventor, Willey). It is accomplished by a machine consisting of a large drum and three small cylinders mounted in an enclosed frame. Powerful hooked teeth are geared on a drum which rotates with great rapidity, and the matted sections of wool, being fed into the drum, pass on to the spikes of the lesser cylinders ; the matted locks are gently torn asunder, and the whole wool is delivered in a light, free, and disentangled condition. In various of the South American products, there is a difficulty which requires additional care. There are little burrs and small adherent seeds which insist on remaining in the wool, no matter what the processes previously described may have accomplished. One method of eliminating them is chemical ; another mechanical. The chemical treatment consists in steeping the wool in a dilute solution of sulphuric acid, and quickly drying it at a point of 250° F. The process will leave the wool uninjured, while the vegetable matter will be found to have been completely carbonized by the action of the acid, and can be readily removed. A solution of the chloride of aluminum has also the same effect, and is thought by some to be less harmful to the fibre of the wool and less hurtful to the workmen than the sulphuric acid process. A mechanical appliance is sometimes used, but the removal of the burrs and other foreign articles carries away so many fragments of wool that it is not regarded with great favor.

Oiling.—The wool having been thoroughly cleansed is more or less harsh or wiry to the touch, owing to the removal of the yolk, or natural lubricant. In order to make it soft and pliant, a sprinkling of olive oil is given. This has the advantage of securing a certain adhesiveness of the fibre in the subsequent spinning process, and prevents loss from the flying off of separate fibres. It is sprinkled in an exceedingly fine spray as the wool, thinly distributed, is carried by an endless cloth through the machine under the sprinkler.

Raw Material.—Up to this time the material is designated as *raw*—that is, unmanufactured material. Wool is the raw material of yarn, as yarn is the raw material of cloth. It is the material for fabrication, in its natural state, or with reference to the processes of manufacture, in the partially manufactured state to which it must be brought prior to treatment by those processes.

Carding.—The final process connected with the *raw* material is the *blending* and carding. By blending is meant the addition to pure wool of other grades, as well as, to no inconsiderable extent, the added material of shoddy, mungo, or extract wools. Blending with cotton is also practised, and for some purposes silk and wool are mixed. The carding process is complex, delicate, and expensive. A series of card-covered cylinders of different diameters, running at different rates of speed and in different directions, contend with each other for the wool supplied to the machine. The wool is entered by a carefully equalized and distributing mechanical feed, and when it leaves the machine is in the form of a continuous equally distributed *lap*, which is wound on a revolving roller. To prepare the lap for spinning, it is divided into a series of strips or ribbons, and these are condensed into a rounded carding or *sliver* sufficiently compact to bear winding on a bobbin. This is the first condition of the yarn—that is, the *first drawing*. The condenser for accomplishing the act is attached to the finisher-card of the machine, and consists of rings or bands of card cloth, of the width of the strip to be made. By a peculiar oscillating motion, the effect desired is obtained, and in the subsequent operations the rounded, loose, untwisted fibres are drawn out to the degree of tenuity required in the yarn to be made.

Gilling.—Leveling the fibres and making them parallel. The machine by which this is accomplished consists of a pair of rollers which catch the wool, and of a second pair of rollers, which draw it forward over heavy steel bars, called *fallers*, covered with projecting steel pins. The machines are generally used in sets, each successive machine having the pins on the rollers finer and more closely set than that preceding. The wool is fed to the rollers ; is caught by the rows of steel pins which rise in close and constant succession and penetrate the wool presented to them, traveling forward with it to the second pair of rollers which in their turn catch the fibre and draw it away. The *fallers* are so called because when they have accomplished their journey, they, by the agency of an endless screw mechanism, fall down, and by the action of other endless screws are returned to their original position. There is thus a continuous line of fallers traveling between the feed-rollers and back-rollers, and there is a steady and constant drawing of wool away from the front rollers and through the teeth of the fallers. Five or six of these machines usually constitute a set. They are all constructed on the same principle, but with the pins finer and more closely studded as the fibre travels onward. In the first three machines it is usual to have the wool delivered in the form of a broad *lap*, but in the later machines, or *boxes*, as they are also called, the product is condensed into a *sliver*, and is received in large cylindrical tin cans. Six of these cans are brought to the front of the next gilling machine, and the six slivers are fed in, and passing through are drawn into and delivered as one. This operation is repeated three or four times, and the fibres are brought even with each other, and a very level and uniform strand produced.

Slubbing.—A preparatory spinning. It consists in drawing out the wool into a soft, weak thread. Several spindles are set in a frame and receive a turning motion. The

frame, or, properly speaking, the carriage, travels backward a distance of about six feet. As it moves away from the rollers the thread is twisted, and as it returns, the twisted portion of the thread is wound upon the spindles. The complicated motions of the machine are regulated by gearing and belting from headstocks on the stationary frame. The full twist is given while the carriage remains standing at the end. The yarn at this stage of the proceeding is known as *singles*. It is wound on bobbins, and when two-, three-, or four-ply yarn is wanted, the bobbins are placed on pegs in a twisting frame. The twist is given in the reverse direction from that in which the singles are spun. Numerous variations of the method are employed in order to produce loops, knots, and other irregularities, for convenience in weaving or knitting fancy textures. Great care has to be exercised in order to produce the fineness and firmness requisite for weaving. In view of the variable lengths of the filaments of wool, the drawing rollers between which the wool passes in spinning, are so mounted as to be adjustable at different distances, and prevent the soft thread from parting because of an undue length, or broken when too short, for want of space for the fibres to slip one upon the other.

In worsted work, the bobbins of elongated rovings (the slightly twisted slivers) are placed on pegs on a frame canted forward, so that the roving, as drawn off, comes away at right angles from the bobbin. Passing between a pair of rollers, the rovings are carried on to other rollers covered with leather, the lower roller being grooved, or furrowed. Between these two sets of rollers the final drawing is effected, and the amount of attenuation effected is dependent on the relatively faster rate at which the front rollers rotate as compared with the rear set. During the short journey, the twist is imparted by a spindle working in an apparently erratic manner, nevertheless with wonderful regularity. The doubling, and subsequent treatment are much the same as with wool.

Shoddy.—This belongs to wool, and is the fibrous material obtained by tearing into fibres, refuse woolen goods of any kind, especially rejected stock. It differs from *mungo*, in being of an inferior quality, and is spun into yarn with a little fresh wool, and made into a coarse cloth. It has but little elasticity, and is tender. The term was formerly one of opprobrium in connection with woolen manufactures, yet the substance is universally recognized as a material of great utility for many purposes when warmth is more essential than toughness and elasticity. Shoddy and mungo are prepared by dusting the rags and fragments, classifying them according to color and quality, then passing them into a machine, technically called the *devil*, where they are literally rended to fragments, which have the appearance of dust more than of fibre. Shoddy is practically a new source of textile material. Its employment is a utilization of waste, and furnishes cheap, serviceable textures. The wool consumption in the United States in 1895 was 6.32 pounds per capita, of which 46.1 per cent. was foreign material. The world's supply of wool in 1896 was 2,582,103,000 pounds, of which the United States produced 272,474,708 pounds. According to the census of 1890 the value of the woolen goods produced for the census year amounted to $337,768,524. Of this, $137,930,014 was for woolen goods proper, and $72,194,642 was for worsted goods. The remainder was for felted goods, carpets, hosiery, etc. Massachusetts is the leading state in the manufacture of woolen goods.

Weaving is a matter of such importance that it must of necessity be treated particularly under its special title. As a matter of fact the most important features connected with woolen manufacture are those which are carried on subsequent to the weaving process. The cloth from the loom is called *roughers*. It has an irregular, slack aspect, and is in an exceedingly crude condition as compared with the elegant broadcloth on the merchant's counter. The web, as it leaves the loom, is still saturated with the oil sprinkled on it while yet in the wool, and impregnated with the size subsequently given to the yarn for tenacity and consistency in weaving. For the removal of these objectionable features there is a scouring process with hot soap suds in a trough having a convex bottom, and fitted with wooden mallets which perform a beating almost unexampled. After the scouring process, the fabric is subjected to a stretching in a frame specially designed, and every imperfection is carefully removed. This latter is designated as *burling*, and consists of critically examining the whole texture for imperfections. These may be of knots, or burrs, all of which must be skillfully removed. If holes are discovered, they must be carefully darned. It is the process preparatory to *fulling*.

Fulling.—The process of cleansing, scouring, and pressing is embraced under the term *Fulling*. The fabric is fed into a machine, where, by means of rollers, stampers, and beaters, it is, while immersed in suds and *fuller's earth*, cleansed, beaten, rolled, and pressed. By this procedure, it is felted together till the required texture is obtained. There is invariably a certain shrinkage, but this is regarded as unavoidable. The hotter the water, the greater the shrinkage of any woolen fabric. It is caused by the serrated, wavy structure of the wool. The operation of fulling, or milling, as it has been termed in later years, is to saturate the cloth with hot soap and water, when it is worked either by the falling stocks of the fulling machine, or pressed and rubbed between rollers in the more modern milling machine. The more the cloth is soaked and beaten, the more it will shrink, and the operation can be carried on till the cloth is reduced to half its original length and breadth. The degree of fulling is a distinctive feature of many

varieties of goods. In broadcloths, and all kinds of nap-finished goods, the milling is carried on until the fibres become densely matted, and the appearance of weaving is entirely obliterated. Venetian cloths and diagonals, to which no pile-finish is given, are fulled or milled only enough to give them solidity and strength. Tweeds have still less. The proper stage of beating or rolling having been reached, the soap suds is gradually supplanted with pure water, tepid at first, but each new supply being cooler, until the fabric is finally worked in thoroughly pure and cold water.

On being taken from the machine the cloth is stretched uniformly in all directions by hooks on a frame, that it may dry without wrinkle or curl. At this stage the operation of *teasling* is entered upon. This is the raising of the *pile* or *nap* by the agency of the cone-like spike-head of the teasel, a plant of the genus *dipsacus*. The head is covered with imbricated scales which end in sharp recurved hooks of great elasticity, but stiff enough to do the work required. The work was formerly done by hand manipulation, but is now accomplished by the *gigging-machine*, or *gig-mill*, where the teasels are arranged on the face of revolving cylinders before which the fabric is made to pass. By this operation the loose ends of the wool are drawn to the surface, thereby forming the nap. Wire teasels are sometimes used, but nature's creation of the vegetable teasel is regarded as having never been improved upon.

Cropping.—Trimming the pile to produce uniform surface. Formerly the work was done by hand with huge shears, but now by a machine containing a cylinder armed with a series of helical knives, and made to revolve with great rapidity. The machine was invented by Leonardo da Vinci, but not brought into practical use until 400 years later.

The final process is the brushing of the cloth, winding it tightly around a huge drum, and immersing it in water heated to 180° Fahrenheit. It remains in that condition for three or four hours, when it is unwound, the ends reversed and rewound, and again the cloth is subjected to the hot water process. The closing act in its manufacture is the pressing in an hydraulic press, during which time steam is forced through it, this last proceeding adding to the solidity and smoothness of the cloth, and developing the lustre characteristic of a well-finished fabric.

WOOLLETT, WILLIAM, one of the most eminent of English engravers, was b. in the year 1735 at Maidstone. He went early to London ; studied his art under a practitioner of the name of Tinney, now only remembered as having taught him little or nothing; taught himself, however, a good deal, notwithstanding the aid of Tinney, and develop ing a manner of his own, soon became known as one of the most accomplished engravers of his time. In recognition of his merit, he was ere long appointed engraver to George III. As to his life, except as he is proved to have existed by his works, familiar at this day to every one, nothing is known. He died in London, in the year 1785, after a life of continuous and conscientious labor, as reward of which, a monument was erected to him in Westminster abbey. His works, more especially in landscape, continue to be much prized by connoisseurs.

WOOLMAN, JOHN, 1720–72 ; b. in w. N. J.; worked on a farm till the age of 21; became clerk in a store at Mount Holly; opened a school there for poor children; became a tailor; desiring to visit the Friends (to which denomination he belonged) in the back settlements of Virginia, went on a tour with Isaac Andrews, 1746; visited the societies of Friends in different parts of the colonies, supporting himself by work at his trade; spoke and wrote frequently on slavery; visited the Indians on the Susquehanna, 1763; went to England for health, 1772. He was a faithful, self-denying Christian worker. He published: *Some Considerations on the Keeping of Negroes; Considerations on Pure Wisdom and Human Policy, on Labor, on Schools, and on the Right Use of the Lord's Outward Gifts; Considerations on the True Harmony of Mankind; The Journal of the Life and Travels of John Woolman in the Service of the Gospel.*

WOOL, MINERAL, called also, SILICATE COTTON, is a vitreous substance converted to a fibrous condition, by allowing a steam blast to strike against a small stream of melted cinder or slag. In appearance it consists of a mass of very fine soft fibres interlacing each other in every direction, thus forming an innumerable number of minute air cells. Furnace slag, if not containing too much silica, is the cheapest and most abundant substance for the manufacture of mineral wool, but a better cinder from which to manufacture it is produced by mixing four parts orthoclase feldspar with six parts dolomite limestone. Its general color is white, but the presence of manganese or potash produces a green color, while cinder from some furnaces produces a beautiful pink tinge. Among the many important properties of mineral wool may be noticed particularly its power to resist the transmission of heat and cold, and its non-combustibility, it being practically indestructible by heat, hence it is being largely adopted by architects and builders. It also possesses especial value as a non-conductor of sound, and thus is desirable in school buildings, music halls, or wherever insulation of sound is desirable. It was first manufactured in Osnabruck, Germany, in 1871, and in this country in 1875.

WOOLSACK, the name given to the seat of the lord chancellor of England in the house of lords, which is composed of a large square bag of wool without either back or arms, and covered with red cloth, The woolsack was first introduced in the house of lords as the chancellor's seat in the time of Elizabeth, as a memento of an act which was passed against the exportation of wool, that commodity being then the main source of the national wealth of England.

WOOLSEY, Sarah Chauncey ("Susan Coolidge"), b. Ohio, about 1845; a descendant of Jonathan Edwards, and niece of ex-Pres. Woolsey of Yale coll. Her life has been mainly spent in New Haven, Conn., and Newport, R. I. She published her first book, *The New Year's Bargain*, a child's story, in 1871. Among other works are, *What Katy Did* (1873); *Eyebright* (1878); *A Guernsey Lily*, and a volume of poems (1880). She also edited *The Diary and Letters of Mrs. Delany* (1878); and *The Diary and Letters of Frances Burney, Mdme. D'Arblay* (1880). Her children's stories are humorous and natural and her poetry is marked by deep religious feeling.

WOOLSEY, Theodore Dwight, d.d., ll.d., b. N. Y., 1801; graduated at Yale, 1820, and then studied at the Princeton theological seminary. In 1823–25 he was a tutor in Yale College; 1827–30 he studied at the German universities, and on his return was made professor of the Greek language at Yale. Fifteen years later he was made president of the college, and held that office until 1871, when he resigned on account of increasing old age, but continued for some years to give instruction in international law, and occasionally preached at the college chapel. As the head of the college Dr. Woolsey was most successful, not only from his learning, but also from his executive ability. As a publicist his reputation was international. The most important of his writings are his editions of the *Alcestis* of Euripides, the *Antigone* and *Electra* of Sophocles, the *Prometheus* of Æschylus, and the *Gorgias* of Plato; *An Introduction to the Study of International Law* (1860)—his most important work and a standard authority; *An Essay on Divorce and Divorce Legislation* (1869); *The Religion of the Present and of the Future* (a collection of sermons); *Communism and Socialism*, and *Political Science*. Pres. Woolsey also edited and added notes to Lieber's *Civil Liberty* and *Political Ethics*. He was the chairman of the American branch of the committee having charge of the revision of the New Testament issued in May, 1881. He d. 1889.

WOOLSON, Constance Fenimore, b. Claremont, N. H., in 1838; grandniece of Fenimore Cooper, the novelist. She received her early education in Cleveland, O., whither her parents had removed, and then attended school in New York. Her first literary work was a short sketch in *Harper's Magazine* (1870), which was followed by other sketches and stories in various magazines. She has published, *Two Women, a Poem;* a collection of her stories called *Castle Nowhere; Lake Country Sketches; Rodman the Keeper; Southern Sketches; Anne*, a novel which appeared first in *Harper's*, 1881–2; *For the Major* (1883); *East Angels* (1886); *Horace Chase* (1894). She died in 1894.

WOOLSTON, Thomas, a heterodox divine of the English church, equally remarkable for ingenuity and learning, and for the singularity of his opinions, was born at Northampton in 1669. He was educated at Sidney Sussex college, Cambridge; was elected a fellow of his college; entered into holy orders, and in due course proceeded to the degree of bachelor of divinity. Gifted with a lively fancy, he became a diligent and appreciative student of the works of Origen, and by them seems to have been first imbued with a taste for the allegorical interpretation of the Scriptures. That he was disposed to carry this principle of interpretation much too far for his contemporaries, appeared at once from his first work, published in 1705. This was, *The Old Apology for the Truth of the Christian Religion against the Jews and Gentiles revived.* In this work, Woolston maintained that Moses was only an allegorical person, and all his history typical of that of Christ; that the miracles of the Pentateuch were allegorical, and the miracles attributed to Christ and the apostles pure allegory too; and he stigmatized as atheists and apostates all who received the Scripture narratives as literally, historically true. In subsequent publications he went further in the same direction; also maintaining that the Quakers approached more nearly in doctrine and organization to the primitive church than any other religious body; and denouncing clergymen, because they made a profession of the pastorate, as "hireling priests," worshipers of the beast, and ministers of Antichrist. In 1721 he published *The Moderator between the Infidel and the Apostate*, dialogues tending to show that the gospel miracles, by themselves, could not prove Christ to be the Messiah. This work occasioned great scandal: it abounded in expressions considered indecent and blasphemous; and it was only through the intervention of Whiston, who was friendly to him, and in favor of toleration in matters of opinion, that the author escaped a prosecution. Up to 1720 Woolston had continued to live in his college, leading a studious and blameless life, and showing great kindness to the poor. In 1720 he went to live in London; and in 1721 his college, upon some pretext—really on account of the scandal made by his writings—deprived him of his fellowship. The views set forth in the last-mentioned work, Woolston developed more fully in a series of six discourses during the years 1727, 1728, 1729, republished under the title *Discourses on the Miracles of Christ.* He maintained—representing himself, as in all his works, as the defender of true Christian doctrine—that Christ's miracles, in themselves, were open to the gravest doubts; that, in fact, the gospel narratives, if they were to be taken literally, were only a tissue of absurdities; and that the authority of the ancient church was against the literal, and in favor of an allegorical acceptation of them. These views were supported with a good deal of warmth, and mixed up with them were fierce denunciations of the order of clergy. The freethinkers, both in England and on the continent, were now triumphantly quoting Woolston in their favor; and people who had previously been disposed to treat him as a maniac, whose rhapsodies were too wild to call for refutation, began to think it time to rescue the Christian faith from so dan-

gerous and dubious a defender. No less than sixty answers were made to the *Discourses* Now, too—Whiston no longer intervening—an indictment, at the instance of the attorney-general, was brought against Woolston, on account of the blasphemous and irreligious character attributed to his works. He was tried before chief-justice Raymond at Guildhall, found guilty, and sentenced to be imprisoned for a year, and to pay a fine of £100, and ordered to find securities to the amount of £2,000 that he would not repeat his offense. He was imprisoned in the queen's bench prison; and being unable to pay the fine, and both unable and unwilling to provide the requisite securities, the remainder of his life was spent within the rules of the prison. It was not long protracted. He died on Jan. 27, 1731.

WOOL'WICH, a market-t. and parish of Kent, the seat of the chief government arsenal of Great Britain, stands on the s. bank of the Thames, and 9 m. e. of London. It stretches along the bank of the river for two m., and reaches back from the river for half a mile, as far as the brow of the hill, where are the royal artillery barracks and hospital. The general appearance of the town has little to recommend it; but the southern suburbs are handsome and regular. There are numerous places of worship—Established, Roman Catholic, and dissenting, and there are numerous schools, a theater, etc. Its dock-yard, its government manufacturing establishments for the production of material of war of every description (except gunpowder), and the fact that it is a great depot for naval and military stores, and also the headquarters of the great corps of royal artillery, combine to render Woolwich a place of great importance. A royal dockyard existed here as early as 1515, and the *Henrye Grace de Dieu*, which conveyed Henry VIII. to the field of the cloth of gold, is said to have been built here, though this statement has been disputed. The *Royal George* (q.v.) was built here in 1751. The royal dock-yard and ship-building establishment was, however, closed on Oct. 1, 1869. The yard comprised large dry-docks, and a basin 400 feet long by 300 feet wide, and was furnished in every respect with the newest and most efficient apparatus. The royal arsenal, the largest in Britain, contains not only the largest stores of all kinds—shot, shells, cannon, etc.—which are required for our armies, navies, and forts, but it comprises also establishments for manufacturing them, and for constructing gun-carriages, and preparing ammunition for cannon and small-arms. These works are carried on in the three departments called respectively the gun factories, carriage department, and laboratory. On the common, south of the town, is the royal military academy, for the education of cadets destined for the artillery and engineers. See MILITARY ACADEMY, ROYAL; and GUN FACTORIES, ROYAL. Pop. '81, 36,600; '91, 40,848.

WOONSOCKET, a city in Providence co., R. I.; on the Blackstone river, and the New York, New Haven, and Hartford, and the New England railroads; 16 m. n. of Providence. Its area was enlarged in 1871 by the annexation of a portion of Smithfield. In 1867 it was incorporated as a town, and in 1888 was chartered as a city. The city is widely noted for its extensive manufactures of cotton, woolen, and rubber goods, and machinery. The U. S. census of 1890 reported for it, 201 manufacturing establishments, employing $10,096,619 capital and 6417 persons, paying $2,361,617 for wages and $5,532,286 for materials, and having a combined output valued at $9,613,264. There are a high school, public library, several public parks, fair grounds, soldiers' monument, national and savings banks, electric lights, waterworks, and daily and weekly newspapers. Pop. '90, 20,830.

WOO'RALI POISON. Since the original publication of the article CURARI, which is one of the synonyms of this substance, the physiological action of this fearful poison has been carefully studied by Drs. Weir Mitchell, and Hammond, of the United States; and the essay in which their joint labors are recorded is published in Hammond's *Physiological Memoirs* (1863). This essay is so valuable, and contains so much original matter regarding two other allied poisons whose native names are *corroval* and *vao*, that we shall give a brief abstract of its contents; premising that, for the best account of the history of this remarkable poison, the reader should consult Bernard's *Leçons sur les Effets des Substances Toxiques* (1857, p. 238). We shall notice the physical and chemical properties of this poison before describing its physiological action. The best of the earlier investigations of the poison is that of Roulin and Boussingault in 1828, who obtained from the crude "woorala" an alcoholic extract, to which they gave the name of *curarin*. This curarin was a solid transparent mass, of an excessively bitter taste, and possessed in an eminent degree of all the virulence of the woorali. Heintz has subsequently examined the precipitate which tannic acid throws down from the watery solution of the poison, but only found that it contained no nitrogen, and was composed of apparently inert substances, as sugar, gum, resin, extractive matter, tannic and gallic acids, etc. He sought in vain for strychnine in it. Among the chief experimenters on the subject may be mentioned De la Condamine (*Mem. de l'Académie des Sciences*, 1745, t. 62, p. 391); Brocklesby (*Philosophical Transactions*, 1747, vol. xliv. p. 408); Herissant (*Philosophical Transactions*, 1751–52, vol. xlvii. p. 75), who killed a bear with a poisoned arrow in less than five minutes; and nearly killed himself and a small boy who was evaporating an aqueous solution of the poison; both, however, recovered under the influence of fresh air, a pint of wine, and a quantity of sugar; Fontana (1781), who showed that (notwithstanding the above experiment) the vapor is not deleterious, and that the state of the stomach at the time when the poison was inhaled modified the result, an animal with a full

stomach being able to resist the action of a dose that would prove fatal to one of the same size when fasting; Brodie (*Philosophical Transactions*, 1811–12); Virchow and Münter (published in vol. i. of Schomburgk's *Reisen in Britisch Guiana*), who, *inter alia*, showed that the poison, even after being kept dry for five years, is still intensely active—that its physiological action corresponds with the result of analysis in showing the absence of strychnine, and that it rather belongs to narcotic than to tetanic poisons—and that death takes place not from any direct result of the poison, but indirectly, by causing the cessation of the respiratory process; Bernard and Pelouze (*Compt. Rend.*, 1850, t. xxxi. p. 534); Vulpian (*Compt. Rend.*, 1854, t. i., 2d series, p. 73); and Kölliker (*Proceedings of the Royal Society*, 1857), who, among other important conclusions, arrives at the following: (1) That the *urari* (as he terms it) causes death very rapidly when injected into the blood or inserted into a wound; and that when introduced by way of the mucous membrane, its effects are slow, and require a large dose for their production; when applied to the skin of frogs, it is inoperative; (2) it acts through the blood, and destroys the excitability of the motor nerves, while the sensory nerves are hardly at all affected; (3) when artificial respiration is carried on in animals under its influence, many of the secretions are increased, owing to the paralysis of the vascular nerves, and the consequent dilatation of the vessels; (4) that in mammals, the poison causes death by the paralysis of the respiratory nerves and suppression of the respiration, which brings on convulsions as a collateral effect.

WOOSTER, city and co. seat of Wayne co., O.; on Killbuck creek and the Baltimore and Ohio and the Pennsylvania Co.'s railroads; 25 miles w. of Massillon. It is the seat of Wooster university (Pres.) and of the state agricultural experiment station, and has a high school, national banks, electric lights, waterworks, daily, weekly, and monthly periodicals, and manufactories of machinery, pianos, furniture, wagons, brushes, etc. The city is the center of a rich agricultural region. Pop. '90, 5901.

WOOSTER, David, 1710–77; b. Conn.; graduated at Yale college, 1738. Soon after the beginning of the war between Great Britain and Spain he commanded a vessel for coast defense, and was capt. of a sloop-of-war at the siege of Louisburg, in 1745. Ten years later he was col. of the 3d Conn. regiment. He was a brig.-gen. through the campaign in the n., 1758–60, and was one of the first to propose the Arnold expedition against Ticonderoga early in 1775, and in the same year was made brig.-gen. in the continental army. He succeeded Montgomery in Canada, and was mortally wounded defending Danbury, Conn., against Tryon.

WOOTZ is a finely damasked hard cast-steel, which is obtained from India. Faraday found aluminium in a sample which he analyzed, and referred its peculiar properties to the presence of this metal; but other chemists have failed in finding aluminium in wootz.

WORCESTER, a co. in s.e. Maryland, bounded on the w. by the Pocomoke river, adjoining Delaware and the Atlantic ocean; about 475 sq. m.; pop. '90, 19,747. Co. seat, Snow Hill.

WORCESTER, a co. in central Massachusetts, bounded on the n. by N. H., on the s. by R. I. and Conn.; 1551 sq. m.; pop. '90, 280,787. Its dairy products and its manufactures are important. Co. seats, Worcester and Fitchburg.

WORCESTER, city and one of the co. seats of Worcester co., Mass.; on the Blackstone river, and the Boston and Albany, the Boston and Maine, the Fitchburg, the New England, the New York, New Haven, and Hartford, and several branch railroads; 44 miles w. of Boston. It was settled in 1674, incorporated as a town in 1722, and chartered as a city in 1848. The city contains the villages of Barnardville, Blithewood, Bloomingdale, Greendale, Jamesville, Lake View, Leesville, New Worcester, North Worcester, Northville, Quinsigamond, Tatnuck, Trowbridgeville, South Worcester, and Summit, and is connected with Millbury, Leicester, and Spencer by electric railroad. It is built in the valley of the river and on and beyond the neighboring hills, and has an area of 36 sq. miles. Worcester is regularly laid out with broad, well-shaded streets. Main and Front are fine business streets, with Belgian pavements, and Oak avenue, Grant square, Harvard, and Elm are among the beautiful residence streets. There are 11 parks, with an aggregate of 360 acres, the most noteworthy ones being Elm, Institute, Normal Hill, North, University, and Crompton. The grounds of the Agricultural society (25 acres) are used for horse, foot, and bicycle-racing, for ball-playing, and for the annual county fair and cattle show. Waterworks, costing about $2,000,000, collect from the elevated water-shed in the vicinity an abundant supply of the purest water. There is an efficient fire department and an admirable drainage system, with works where the sewage is purified by chemical precipitation. Among the prominent public buildings are the co. court houses, city hall, classical and English high schools, Y. M. C. A. and Y. W. C. A. buildings, the quarters of the American Antiquarian society, Mechanics' hall, free public library, armory, city hospital, isolation hospital, Worcester lunatic hospital, Worcester insane asylum for chronic cases, Washburn memorial hospital for women and children,

St. Vincent's hospital, Hahnemann hospital, and co. jail. Of the many churches, the New Old South, Central Congregational, All Saints' (P. E.), and St. Paul's (R. C.), are most noteworthy. Worcester is famed for the number and superiority of its educational institutions. There are a state normal school, the Worcester polytechnic inst., Worcester academy (Bap.), Highland military academy, College of the Holy Cross (R. C.), and Clark university for post-graduate study (q.v.). There are several convents and Roman Catholic parochial schools. There are homes for aged women, old men, orphans, and various other beneficent institutions.

Although 45 m. from the sea-coast, bringing all its raw materials from a distance, and having but little water-power, yet the inventive genius of its mechanics and the energy of its business men have made Worcester a most prosperous manufacturing center. Special machinery for making wire goods, cotton, woolen, and silk fabrics, hydraulic elevators for folding envelopes, for wood-working, and other notable inventions, have here been made or perfected. For the census of 1890, 996 establishments, representing 134 different industries, reported a combined capital of $25,230,620; persons employed, 21,729; wages, $11,694,121; cost of materials, $21,208,904; value of products, $39,533,869. The principal manufactures are wire, woolen goods, Brussels carpet, corsets, envelopes, machinists' tools, cotton and woolen machinery, mowing machines, agricultural tools, wood-working machinery, boots and shoes, bicycles, and leather belting and hose. There are several national, savings, and co-operative banks, insurance companies, and daily, weekly, and monthly periodicals. The first printing-press was established by Isaiah Thomas in 1775, and the first paper issued was the *Massachusetts Spy*, still published. Pop. '90, 84,655.

WORCESTER, an English city, and capital of the county of the same name, and a county of itself, stands almost in the center of the Severn valley, and is situated principally on the eastern bank of the river, about 27 m. s.w. from Birmingham. Worcester is of great antiquity; there are abundant traces of ancient iron-smelting works on the banks of the river, adjudged by antiquaries to belong to the times of the Roman occupation; and the frequent discovery of other remains proves that the city was a Roman station. The chief object of antiquity now existing is the cathedral, which is beautifully placed on a gentle elevation on the e. bank of the river, and stands within its own precinct, but which, since the passing of the act abolishing the isolation of "peculiars" and "non-parochial places," has been incorporated in the city parish of St. Michael. A cathedral, dedicated to St. Peter, was founded here as early as the 7th c. In 1084 bishop Wulstan laid the foundation of a new cathedral, many portions of which remain in the present structure, such as the crypt (one of the oldest and most interesting in England), the bases of, and fragments in, many of the walls, chapter-house, refectory, and cloisters. In the civil wars much damage was done to the building, but none of its leading features were destroyed. It is now distinguished by the simplicity, if not plainness, of the exterior, but which is amply compensated by the fine perspective, the lofty roof, and generally charming effect of the interior. A thorough restoration was commenced in 1855 under the late sir G. G. Scott, and completed at a cost of about £100,000. The cathedral is 450 ft. long, 78 ft. wide at the nave, and 126 ft. wide at the w. transepts, and it is 67 ft. high. The central tower is 196 ft. high. The cathedral grammar school occupies the refectory, a fine hall dating from the 14th century and recently restored. The tombs of king John and of Arthur, prince of Wales (eldest son of Henry VII.), are the chief ancient monuments in the building. The episcopal palace in the city has been transformed into the deanery; and the bishop of Worcester, since the ecclesiastical commissioners assumed the management of the episcopal and capitular estates, has his residence at Hartlebury castle. There is also a city grammar school, founded by queen Elizabeth, and largely attended. The parish churches of the city, 11 in number, are poor specimens of architecture. The city does not shine in public buildings. Next to the cathedral, the most important are the shire-hall, the guild-hall (110 ft. long, with a number of statues of monarchs, and containing a brass cannon used at the battle of Worcester), and the county prison; but there are also the city library, the Worcester museum, a corn-exchange, and music-hall. The battle of Worcester, fought in 1651, is memorable in history. Its inhabitants were thoroughgoing royalists, and when Charles II. in 1651 entered the city with the Scottish army he was received with enthusiasm. Cromwell soon followed and took his stand on the Red Hill near the city gates. Lambert with a considerable force had advanced along the other side of the river, and Charles, seeing his enemy divided, made an attack on Cromwell's force, and was at first successful, but Lambert succeeded in throwing his division across the river to Cromwell's support. The result was a complete overthrow of Charles's army and he was obliged to resort to disguise in order to escape from the city. Charles II., to commemorate the fidelity of the citizens to his cause, granted the motto to the city arms: "Civitas in bello et in pace fidelis." Pop. of the city, '91, 42,905. The people are employed in glove-making, including leather-dressing and staining; in porcelain factories, iron-works, including locomotive-engine factories; tanning and currying, horse-hair weaving, vinegar, British wine and sauce-making, and coach-building. Chemical manures and agricultural implements are also manufactured on a considerable scale. Glove-making is still considered the staple manufacture of the city; but one large factory has absorbed a large portion of the business, and now

there are not above two dozen of master-glovers, great and little, whereas 40 years ago there were nearly 100 in the trade. There are royal porcelain factories, and the number of hands employed by them in all departments is about 600.

WORCESTER, a town and village in Otsego co., N. Y.; on a tributary of the Susquehanna river, and the Delaware and Hudson railroad; 63 miles w. of Albany. The principal industries are farming, dairying, milling, and hop-raising. Pop. '90, 2741.

WORCESTER, Edward Somerset, Marquis of, 1601–67; b. England; his father being the first marquis of the name. He was a royalist in the revolution, and for a long time defended Raglan Castle against the Puritans. He was the first to invent and make an engine worked by the power of steam. This was described in *An Exact and True Definition of the most Stupendous Water-Commanding Engine, invented by the Right Honorable (and deservedly to be praised and admired) Edward Somerset, Lord Marquis of Worcester*, and may also be found described in a life of Worcester published by Dircks in 1865.

WORCESTER, Joseph Emerson, ll.d., 1784–1865; b. N. H.; graduated at Yale college in 1811. While teaching school at Salem, Mass., he was engaged upon his *Geographical Dictionary*, or *Universal Gazetteer*, which appeared in 2 vols. 1817, and was followed the next year by *The Gazetteer of the United States*. In 1819 he took up his residence at Cambridge, Mass., where the rest of his life was spent, with the exception of a visit to Europe in 1830, which he employed in making researches and collecting materials for his studies in lexicography and philology. He edited the *American Almanac*, 1831–43; published an edition of Johnson's *Dictionary* in 1827; made an abridgment of Webster's *American Dictionary* in 1828, and published a *Comprehensive Pronouncing and Explanatory Dictionary* in 1830. His *Universal and Critical Dictionary of the English Language* appeared in 1846. His quarto *Dictionary of the English Language* was published in 1860. An edition, with additions, was published in 1881. Among his other works are an *Epitome of Geography* (1820), and *Pronouncing Spelling-Book* (1857).

WORCESTER, Noah, d.d., 1758–1837; b. N. H.; served three campaigns in the revolutionary war, being a fifer at Bunker's hill and a soldier at Bennington; resided at Thornton, N. H., and was sent to the legislature; published in 1787 a *Letter to the Rev. John Murray on the Origin of Evil;* pastor of the church in Thornton; employed by New Hampshire missionary society, 1802. He published, 1810, *Bible News, or Sacred Truths Relating to the Living God, His only Son, and Holy Spirit*, which was condemned as heretical by the Hopkinton association; edited *Christian Disciple*, Boston, 1813–18; published, 1814, *A Solemn Review of the Custom of War, by Philo Pacificus;* was one of the founders of the Massachusetts peace society, and its secretary, 1816; edited *Friend of Peace*, 1819–29. His other works are: *The Atoning Sacrifice a Display of Love, not of Wrath; Causes and Evils of Contentions among Christians; Last Thoughts on Important Subjects.*

WORCESTER, Samuel, d.d., 1770–1821; b. N. H.; brother of Noah Worcester; graduated, Dartmouth college, 1795; pastor Congregational church, Fitchburg, Mass., 1797–1802; of Tabernacle church, Salem, Mass., 1803 till his death. He was elected corresponding secretary of the American board of missions, 1810. He was prominent in the Unitarian conflict. He published *Six Sermons on the Doctrine of Eternal Judgment; Discourses on the Covenant with Abraham; Three Letters to Dr. Channing on Unitarianism; Watts's Entire and Select Hymns.* A posthumous volume of sermons was published.

WORCESTER, Samuel Melancthon, D.D., was a son of Rev. Samuel Worcester, and was born in Fitchburg, Mass., in 1801. He graduated at Harvard in 1822, and then spent one year in Andover Theological Seminary. He was tutor in Amherst College, 1823–25; professor of rhetoric and oratory, 1825–34; and pastor of the Tabernacle Congregational Church in Salem, 1834–60. He was for a time in the state senate and house of representatives. He wrote his father's life; *Essays on Slavery* (1826), etc. D. 1866.

WORCESTER, Thomas, 1795–1878; d. Waltham, Mass. He was the first pastor of the New Jerusalem church in Mass., holding a charge in Boston as early as 1818. He was for many years pres. of the convention of his church. By both his character and his abilities he commanded universal esteem.

WORCESTER COLLEGE, Oxford, was founded, like Trinity and St. John's, on the site of an old monastic college. The ancient institution was known by the name of Gloucester college, because it belonged to the Benedictine monks of that city. After the dissolution of th monasteries, it passed through various hands; and latterly was a hall attached to St. John's college. In 1701, however, sir Thomas Cookes left £10,000 for the purpose of endowing some existing college or hall. This bequest led to the erection of Gloucester Hall into a college, for a provost, six fellows, and six scholars, by letters-patent of queen Anne, 1714. Various fellowships and scholarships were afterward added, until the number of fellows became 21, of scholars 16, but almost all restricted to certain counties, or to founders' kin. The commissioners under 17 and 18 Vict. c. 81 reduced the number of fellowships to 15, open without restriction, except that candidates for a fellowship on the Eaton foundation must be sons of clergymen of the church of England and Ireland, and must not be possessed of property or income exceeding £150 a year. The scholarships are now 16 in number—six on the foundation of sir Thomas Cookes, for persons educated at Bromsgrove school; one on the founda-

tion of Dr. Finney, for natives of Staffordshire; five on the foundation of Mrs. Sarah Eaton, for sons of clergymen of the church of England; and three on the foundation of Dr. Clarke, and one on the foundation of Robert Barnes, esq., which are entirely open. Most of the scholarships are of the value of £75, tenable for five years. There are also six exhibitions—four on the foundation of sir Thomas Cookes, value £42 a year, for persons educated at Bromsgrove school. There are ten benefices in the gift of this college.

WORCESTERSHIRE, one of the west-midland counties of England. The conterminous counties are those of Warwick and Stafford on the n., Warwick and Oxford on the e., Gloucester on the s., and Hereford and Salop on the west. Area, 480,560 acres, whereof about 404,000 are cultivated. Its greatest length is 38 m., and greatest breadth, 26. The surface is undulating, and there are depressed valleys and hilly ranges; two of the latter are of considerable extent, and adorn its eastern and western sides. On the west, the range terminates in the Malvern hills, one of the highest points of which is the Worcestershire beacon, about 1444 feet above the level of the sea. Its name is derived from its shape, a cone towering beacon-like above the lesser eminences of the chain; but the highest peak of the range is named the Herefordshire beacon, which stands within the county of Hereford. The eastern range is the Bredon hills, which form part of a chain extending from Bromsgrove Lickey, near Birmingham, to the Cotswold hills, near Gloucester. The county is well watered, and finely timbered, especially with fruit-trees. The elm grows very luxuriantly, and indeed is so common in every corner as to have obtained the name of "the weed of Worcestershire." The oak, beech, and other timber trees thrive well, and of late the larch has been much planted. The principal rivers are the Severn, the Teme, and the Avon. Other streams there are, such as the Stour, the Salwarp, etc., but except in flood-times, these are mere brooks, and scarcely deserve the name of river. The Severn is navigable for vessels of 80 tons as high as Worcester, and for those of 60 tons to Stourport, 14 m. further; and smaller boats can reach Shrewsbury, the river being navigable for 180 miles. There are three canals communicating with the Severn—viz., the Staffordshire and Worcestershire at Stourport; the Droitwitch, a little way above Worcester; and the Birmingham and Worcester, in the immediate neighborhood of the city. The w. portion of the vale of Severn is about 30 m. long; the climate is mild and healthy; but the rainfall is comparatively small, and nearly the minimum of England. There are mineral springs at Malvern, Evesham, Dudley, and Kidderminster. Nearly the whole of the county is on the red sandstone formation, but the Malvern and Lickey hills are of igneous origin. The soil consists of almost every variety suitable for vegetation, from strong deep clay and rich vegetable mold, to light friable sandy ryeland, with tracts of alluvial deposit, marl, and loam. The vale of Evesham is dependent on the Avon for its fertility, which has long gained for it the reputation of being the garden of the mid-west. It produces abundance of table-fruit, and vegetables of the finest quality. The agriculture of Worcestershire has been greatly improved during the last thirty years, and high-farming is now much in vogue. Excellent crops of wheat and other grains, turnips, and potatoes are raised; a large portion of the land remains in the form of meadow, and much of it ancient pasture.

Hop-gardens are beautiful in the western division of the county, and their produce ranks, in the estimation of brewers, next to that of e. Kent. Worcestershire is *par excellence* a perry county, as Herefordshire and Devonshire are cider counties. Its pear orchards are very beautiful in the time of blossom; and there is a splendid variety, called the "black pear of Worcester," which attains a great size, and is supposed to be the traditional pear blazoned on the county's shield of arms.

There is no distinctive local breed of stock, either cattle or sheep. The cattle in most favor are Herefords and shorthorns; and among sheep, the favorite varieties are Shropshire downs, Leicesters, Cotswolds, and cross-breeds. Pigs are abundantly bred and fed. The markets are well supplied with butcher-meat, bred and fed in the county; and London, Birmingham, and the "black country" draw large supplies from Worcestershire. Poultry are raised in considerable quantity, and the Worcestershire farmers' wives have deservedly obtained a good name for the condition and neatness in which they are sent to market. The county possesses great mineral wealth in coal, iron, salt, lime: the first three are found in the north-eastern quarter of Worcestershire, but lime is very generally distributed. Coal and iron mines are largely worked in the neighborhood of the populous borough of Dudley. Iron-works abound between it and Stourbridge, where glass manufactures of an ornamental character, on a large scale, have taken root; and there are abundance of coal-mines in the neighborhood. Quarries of limestone are largely wrought near Evesham and Pershore.

The textile fabric manufactures are nearly confined to carpet-weaving, which has long been carried on successfully at Kidderminster; but the town has almost ceased to produce that description of goods known by its name, "brussels" and "tapestry" being principally manufactured. At and in the neighborhood of Worcester a considerable number of persons are engaged in glove-making. Worcestershire china, which has gained a world-wide reputation, is also produced upon a large scale in the capital city. At Redditch, the needle and fish-hook manufacture is carried on to a greater extent

than in any other place in England; nail-making has been practiced for centuries at Bromsgrove, and at Droitwich, about 6 m. from Worcester, salt has been manufactured for many centuries from an inexhaustible supply of brine. Pop. (1891), 413,755. The majority of the inhabitants are engaged in the mines and manufactories, and the remainder divided between agriculture and trade. The manufactures include hardware, nail-making, the manufacture of iron and steel, glass and porcelain, needles, fish-hooks, tools, fenders, fire-irons, shovels, screws, rivets, swords, cutlery, and steel toys. The county is in the Oxford circuit, and in the district of the Birmingham court of bankruptcy. The county sends three members for the boroughs of Evesham, Droitwich, and Bewdley and five others—making a total of eight members from Worcestershire. In the time of the Romans this country was all forest and jungle, but the English added it to Mercia in the 7th century and its growth began.

WORD, in time of peace, a signal notified in the orders of the day, in virtue of a knowledge of which a sentry will allow the utterer to pass. In the field the officer commanding fixes daily upon a word and countersign (for which any arbitrary terms are taken), and communicates them to the sentries on guard, and to such other persons only as he may choose to permit to pass through the lines. Any person then approaching a sentry without knowing the *word*, has a fair chance of being shot; if he knows not the countersign, the sentry will take him into custody, and deliver him to the officer of the guard. Care has to be taken that the "word" should not suggest the "countersign." Any arbitary combination is therefore adopted.

WORDE, Wynkin de. In returning to England about 1477 to introduce the art of printing, William Caxton (q.v.) brought with him Wynkin de Worde, a native of Lorraine, whose acquaintance he made at Cologne. De Worde superintended Caxton's printing-office till the latter's death, and afterward succeeded him. He made great improvements in the art of printing, and especially in that of type-cutting, which then formed a branch of the profession. He is said to have first introduced Roman letters into England, using them as we now use italics. In some of his books he even introduced a sprinkling of Greek, Hebrew, and Arabic, which were produced in wood-cut. He also made extensive use of engravings, which, however, appear to have been mostly obtained from the continent. The books printed by him are generally distinguished by their neatness and elegance, and far exceed in number those of his predecessor, being 408 distinct works against 99 by Caxton. De Worde died in London about 1534.

WORDEN, John Lorimer, b. N. Y., 1818; entered the navy as midshipman, 1835. In 1861 he was sent to fort Pickens with dispatches, and while returning was made prisoner and detained seven months. In 1862 he was given command of the experimental iron-clad *Monitor*, and on Mar. 9, fought the famous battle with the confederate ram *Merrimac*, in Hampton roads. His eyes were partly blinded by a shell striking the look-out hole of the pilot-box. In 1863, in command of the *Montauk*, he destroyed the privateer *Nashville*, and took part in Dupont's attack on Charleston. From 1869 to 1874 he was at the head of the U. S. naval academy at Annapolis. Retired, 1886. D. 1897.

WORDSWORTH, Charles, d.c.l., b. England, 1806; graduated with honors at Oxford, 1830; tutor at Cambridge, 1830–33, having William E. Gladstone and cardinal Manning among his pupils; second-master of Winchester college, 1835–46; first warden of Trinity college, Scotland, 1846–54, contributing largely to its establishment, and building the chapel at an expense to himself of $44,000; consecrated bishop of St. Andrews, 1853; has zealously endeavored to obtain "a united church for the United Kingdom;" is author of several theological works and of a popular Greek grammar, and is a member of the New Testament revision committee. He died 1892.

WORDSWORTH, Christopher, d.d., 1774–1846; b. Cumberland, Eng.; graduated at Cambridge and became a fellow of Trinity college, of which he was master 1820–41. He published *Ecclesiastical Biography* (1810); *Who Wrote Eikon Basilikè?* (1824); *Christian Institutes* (1837); and a volume of sermons.

WORDSWORTH, Christopher, d.d., b. England, 1807; son of Dr. Christopher, of Trinity college, Cambridge, and a nephew of the poet. He was educated at Winchester and Cambridge, took orders in the church of England, and was head-master of Harrow school, 1836–44, when he became a canon of Westminster. In 1868 he was consecrated bishop of Lincoln. Among his works are an edition of the Greek Testament; *The Memoirs of William Wordsworth; Greece; St. Hippolytus and the Church of Rome.* D. 1885.

WORDSWORTH, William, a distinguished English poet, was b. April 7, 1770, at Cockermouth, in Cumberland. He was the second son of John Wordsworth, attorney, and agent on the estates of the first earl of Lonsdale. He was sent to school at Penrith, where his parents had gone to reside; and after the death of his mother in 1778, was transferred to Hawkshead, in Lancashire, at the public school of which his earlier education was completed. In 1783 his father died, leaving his family in some difficulty. By lord Lonsdale a considerable sum was due to them; but his lordship, a man of most eccentric character, saw fit to resist the claim with all the vexatious impediments which the law so plentifully affords. Enough, however, remained, with some little assistance from relatives, to carry forward the education of the children. Wordsworth remained

at Hawkshead till 1787, in which year he was entered at St. John's college, Cambridge. Here he remained four years. In the studies proper to the place, his interest was slight; but in his own fashion he was a diligent student; and poetry became more and more his favorite pursuit. In Jan., 1791, he left Cambridge, after taking his degree as bachelor. During the autumn of the previous year, he had, along with a fellow-student, made a pedestrian tour through France, then in the early fervors of its great revolution; and thither, after leaving college, he returned. His sympathy with the aims of the revolution was passionate; and with the party of the Gironde he seemed to have cultivated relations of a somewhat intimate kind, which, in the end, might have seriously compromised him, had not circumstances, probably of the pecuniary sort, determined his return to England some little time before his friends were sent in a body to the scaffold. The republican principles which at this time he held, he lived to renounce in favor of a reasoned conservatism; and opposed as he was, in its earlier stages, to the war waged against France, no one more patriotically urged it, when the struggle became in effect a life and death grapple on the part of England with the military despotism of Napoleon.

In 1793 Wordsworth came before the public as an author, in two poems, entitled *An Evening Walk, addressed to a Young Lady;* and *Descriptive Sketches, taken during a Pedestrian Tour among the Alps.* These pieces abound in touches of refined and original observation of nature, but otherwise are not in themselves specially remarkable; and they failed to make any impression, except on a few minds, such as that of Coleridge, then at Cambridge, who afterward professed to have discerned in them the seeds of a great undeveloped genius. Wordsworth was now in a position of much perplexity; his little finances were almost entirely exhausted: for the church, which his friends would fain have had him enter, he had at this time an obstinate aversion; poetry had become with him a passion, to which he longed to wholly dedicate himself; and unhappily it appeared that *his* poetry would not in the least *pay.* As a poet cannot live like a singing-bird by pecking about the hedgerows, it became necessary for him to bethink himself of some means of support; and he was on the point of proceeding to London, to do liberal politics for the newspapers, when unexpected relief came to him in the shape of a legacy. The name of Raisley Calvert deserves to be remembered with that of Wordsworth. An intimate friend of the poet, he had formed a high opinion of his genius; and at his early death in 1795 he was found to have bequeathed to Wordsworth the sum of £900, expressly that leisure might for some years be allowed for the undisturbed development of his powers. Seldom has money been better bestowed; and small as the sum may seem, to a man of the poet's simple tastes and entire singleness of aim, it could suffice over a term of years. With his only sister, Dorothy, his attached companion through life, and always a devout believer in the brother, no little of whose genius she shared, he now settled himself at Racedown lodge, in Dorsetshire, removing in 1797 to Alfoxden, in Somersetshire, in order to be near Coleridge, who had established himself some 3 m. off at Nether-Stowey. Out of the intimacy thus begun came the famous *Lyrical Ballads,* published in 1798 by Cottle of Bristol, as a joint adventure of the two poets. The volume had no success; but probably no man ever lived more serenely self-appreciative than Wordsworth; and he did not allow himself to be disheartened by the neglect meantime of the world. After a short tour in Germany, along with his sister and friend, he returned to his native Cumberland, which he never again permanently left. He settled himself first at Grasmere; in 1808 he removed to Allan bank, in the vicinity; and in 1813 he transferred his household to Rydal mount, the place which, of all others, remains specially associated with his memory. On the death of the old lord Lonsdale, the justice of the claim of the Wordsworths against the estates was admitted; and in 1802 a sum of about £8,000 was by his successor made over to the family. To Wordsworth and his sister their moiety of the money may have been acceptable, as by this time, one should say, they must needs have been seeing pretty nigh to the end of Raisley Calvert's convenient £900. Henceforth a modest competence was secure to them; and Wordsworth was wedded within the year to Mary Hutchinson, a cousin of his own, with whom he had been intimate from his childhood. In 1813, by the kindness of lord Lonsdale, he was appointed distributor of stamps for the county of Westmoreland, a situation which brought him, without much to do for it, a salary of £500 a year. When, the year after, he published his great poem, *The Excursion,* he dedicated it to lord Lonsdale, in a sonnet, expressive of "high respect and gratitude sincere" for this comfortable increase to an income sufficient, perhaps, but certainly not excessive, for a man who had now a family growing up round him. Meantime, and pending the appearance of this elaborate work, the reputation of the poet had been surely, if slowly, rising. In 1800 he had published, in two volumes, a second edition of the *Lyrical Ballads,* disjoining his own from those of Coleridge, and adding a quantity of new matter; and in 1802 and 1805 further editions had been issued. To these succeeded, in 1807, a new collection, under the title of *Poems, in Two Volumes.* In these earlier writings there was a good deal which almost wilfully seemed to invite ridicule; and for a good while Wordsworth was merely the laughing-stock of reviewers, more particularly of Jeffrey, who, as editor of the great *Edinburgh,* at this time figured as chief Aristarchus of the day. The more to popularize the ridicule, a nickname was invented; and "the Lake School," as it was called, which, with Wordsworth, included Coleridge and Southey, who chanced to reside in the same district, passed current as an easy name of scorn. It could not be long concealed, how-

ever, that these volumes of Wordsworth, despite an occasional eccentricity in the choice of mean and impracticable subjects, contained a large body of true poetry of a singularly fresh and original kind. A select circle of passionate admirers, including men like Leigh Hunt, De Quincey, and Wilson, eagerly pressed the true claims of the poet; and after the publication of the *Excursion*, a volume of high and serious verse, gravely defective in plan, and at times heavy and tedious, but with little or no trace in it of the earlier oddities of the writer, it came more and more to be felt that the laughers were getting the worst of it, and that Wordsworth, however he might now and then indulge himself in whimsical tricks, was really a man of true and lofty genius, against whom ridicule could not permanently avail. Their occupation was not yet, indeed, quite done; and the subsequent appearance, in 1819, of *Peter Bell*, a poem not without profound merits, but unhappily with a donkey for the hero of it, allowed them to resume their advantage a little. But, on the whole, the day of idle jeer was over; the tide of genuine appreciation had set in, and it continued to flow steadily, till, long before his death, Wordsworth found himself recognized almost *nem. con.* as at the head of the poetical literature of his country. His later days were passed serenely in honor. In 1839 the university of Oxford conferred on him its honorary degree of D.C.L. In 1842 a pension of £300 per annum was assigned him by government; on receipt of which he ceded, in favor of his son, his situation as distributor of stamps; and on the death of his friend Southey, in 1843, he succeeded to the vacant laureateship. On April 23, 1850, he peacefully closed a life so pure, serene, and priest-like in its consecration to a lofty purpose, that we must go back to Milton in order to find its parallel. It remains only to enumerate the publications of Wordsworth not included above. In 1815 appeared *The White Doe of Rylstone*, which was followed by *The Waggoner*, and a series of *Sonnets on the River Duddon*. In 1822 he published a volume entitled *Memorials of a Tour on the Continent;* some years after, his *Ecclesiastical Sonnets;* and in 1835, *Yarrow Revisited, and Other Poems*, the fruit of a tour to Scotland, memorable by his mournful parting, at Abbotsford, with the dying Scott, which he records in a beautiful sonnet. In 1842 he issued a collected edition of his works, rearranged as we now have them, in a somewhat fanciful fashion of his own. Shortly after his death, a long autobiographical poem, in blank verse, was published, entitled *The Prelude*.

By remanding it to truth and simplicity of natural feeling as its basis, Wordsworth did more than perhaps any other writer of his time to forward the great revival of English poetry which distinguished the opening of the century. But he was scarcely the originator of the movement; the new influence was, so to speak, "in the air;" already Cowper in England, as in Scotland Burns, had preluded to the melodious outburst which was to follow; and to the last of these more particularly, as his early guide and exemplar, Wordsworth has expressly recorded his obligations in a stanza which, so far as we are aware, has hitherto escaped quotation:

> "I mourned with thousands, but as one
> More deeply grieved, for *he* was gone
> Whose light I hailed when first it shone,
> And showed my youth
> How verse may build a princely throne
> On humble truth."

With the charm of natural simplicity of manner, common to him with these his predecessors, Wordsworth, however, combined a depth of philosophic meditation peculiarly his own; there was born with him, moreover, a passionate susceptibility to effects of beauty in the material world, such as few men can ever have been gifted with; and out of these blended elements arose that mystical communion with nature which pervades the whole body of his poetry, and constitutes its truest claim to originality. By diffusion of this, and otherwise, his influence on our subsequent poetry has perhaps been as profound as any of the kind ever exercised, and it has been almost wholly beneficial. Yet we need not admire all we find in him. The early ridicule directed against him, though it sinned by excess and disproportion, was really to a great extent deserved. Had he gone on writing nothing but the "Betty Foys" and "Alice Fells" which Jeffrey laughed at, we should not have had in this place to do a biography of him. It is despite of a good deal of this kind of perverse drivel, besides indifferent matter otherwise, and not in the least because of it, that he continues, and must long continue, to be remembered.—See the memoir by his nephew, bishop Wordsworth; and criticisms by Coleridge, Shairp, Hutton, and others. Knight's complete edition of W. began to appear in 1882.

WORK. To do work is to overcome resistance. If we try to lift a ton-weight, however we may fatigue ourselves, we cannot move it, and therefore we do no work. But we can lift with ease a hundred-weight, and then we do more work in proportion as we raise it higher. In lifting coals from a pit, the work done is evidently in proportion to the depth of the pit, and to the weight of the coals raised. This and numberless other instances are too well known to need further description. We may therefore at once define the *work done by a force as the product of the force into the space through which it moves its point of application in its own direction*, and it is usually measured by engineers and others who do not require absolute accuracy, in *foot-pounds*, the work required to raise a pound one foot high. If the motion of the point of application be in the *opposite* direction to that of the force, the work is done against the force. If the motion be per-

pendicular to the direction of the force, no work is done by or against the force. Thus, the work spent in projecting a curling-stone, in opening a massive gate, or in turning a large fly-wheel or grind-stone, has nothing whatever to do with the force of gravity—the body moved, in all these cases, is, as a whole, neither raised nor lowered as regards its distance above the earth's surface. If the direction of the force be oblique to the direction in which the point of application moves, we must resolve the force, by the law of the parallelogram of forces (see Composition of Forces), into two components, one *in* the direction of motion, the other perpendicular to it. The former is the working component; the latter, as we have just seen, does no work. A good illustration of this is found in the case of raising stones from a quarry by carting them up a series of inclined planes, as contrasted with hauling them up vertically. The work done in either case is measured by the product of the weight of the stones, and the height through which they have been raised; and thus, for the same load of stones, it will be the same whichever process is adopted. This is evident from the property of the inclined plane—viz., that the force required to support a body resting on the plane (which is the force that has to be overcome when we haul it up the plane) is to the weight of the body as the *height* of the plane to its *length*. Hence, this force, multiplied into the length of the plane, gives the same product as the whole weight into the height of the plane; and these are the two quantities of work we are comparing.

When work is done upon a body, there is always an increase of velocity unless other forces act on the body, so that it does an equal amount of work against them. Thus, if we push a movable body, such as a cart, along a road, the velocity gradually increases, and would increase indefinitely were there no friction and no resistance of the air (forces against which work has to be done), and could we move fast enough to keep continually pushing it, however great its velocity may become. If, on the other hand, by means of a rope and pulley, we raise a stone, if once started, it will ascend uniformly, so long as we pull with a force just equal to its weight, because, then, as much work is done on the stone by the hand as it does against gravity. If we pull with a force greater than its weight, we do more work on the stone than it does against gravity, and the upward velocity increases; if with a force less than the weight, the stone has to do more work against gravity than is done on it by the rope, and its velocity upward becomes less. The measure of the excess of work done on a body over that which it does against resistance is *the increase of the product of half the mass into the square of the velocity*—i.e., of what was formerly called the *vis-viva* of the body, what is now called its *actual*, or preferably, its *kinetic energy*. See Force. Hence, as it is evident that if a body, or system, be acted on by a set of forces which are in equilibrium, it will have no tendency to lose or to acquire velocity, its kinetic energy will remain unchanged, and therefore *as much work must be done upon it by some of the applied forces, as it does against the rest, in any displacement so slight as not to change the circumstances of the particular arrangement.* That is, when forces are in equilibrium on a body, if the body be slightly displaced, the sum of the products of each force by the effective component of the displacement of its point of application is zero—the product being positive when the force does work, negative when work is done against it. This is the celebrated principle of *virtual velocities*, the term virtual velocity having been, very inconveniently, applied to what we have called above the effective component of the displacement of the point of application of a force. It was often employed as the basis of the whole of statics, and very curious attempts have been made to give proofs of it (independent of the laws of composition of forces), especially by Lagrange. But the principle of work, or energy, of which that of virtual velocities is a mere particular case, and which is at once applicable to the whole range of dynamical science, is distinctly enunciated by Newton in a scholium to his third law of motion. See Motion, Laws of. His words are memorable, and should be universally known—*Si æstimetur agentis actio ex ejus vi et velocitate conjunctim; et similiter resistentis reactio æstimetur conjunctim ex ejus partium singularum velocitatibus et viribus resistendi ab earum attritione, cohæsione, pondere, et acceleratione oriundis; erunt actio et reactio, in omni instrumentorum usu, sibi invicem semper æquales.* Newton has defined what he means by the velocity of an agent—viz., the component of the velocity of its point of application which is in the direction of the agent. He has also shown what is the measure of resistance arising from acceleration (see Velocity); so that, merely using modern terms instead of those employed by Newton, but in nowise altering the scope of the above remarkable passage, we have the following version of it: *Work done upon any system of bodies* (literally, *the parts of any machine*) *has its equivalent in work done against friction, molecular forces, or gravity, if there be no acceleration; but if there be acceleration, part of the work is expended in overcoming the resistance to acceleration, and the additional kinetic energy developed is equivalent to the work so spent.*

When work is expended in overcoming the resistance to acceleration, i.e., the *inertia* of a body, we have its equivalent in additional kinetic energy. When it is expended against gravity, as in raising a weight or bending a spring, we have it stored up in a dormant form as *potential energy*. See Force. When it is expended in overcoming friction, there appears at first sight to be no equivalent—but the comparatively recent researches of Joule and others have satisfactorily accounted for its disappearance, by proving its quantitative transformation usually into heat, sometimes into other forms of molecular energy. But to pursue this point would lead us again to questions already

treated at some length in the article FORCE. There is one remark, however, which it is important to make. In compressing a gas, in the receiver of an air-gun for instance, we can never recover as useful effect all the work expended. The reason is that a gas is *heated* by compression, so that part of the work spent is converted into this heat, conducted through the metal, and by the principle of *dissipation of energy* lost, at least in part, to man. Had we a gas which could not be heated by compression (take the imperfect analogy of a space filled with fine spiral springs), we should recover, by allowing it to expand, all the work expended in the compression.

One other remark remains to be made. It will be noticed that Newton speaks of the action of an agent as the product of the agent and the component *velocity* of its point of application. This is what we now call *rate of doing work*, or *horse-power*. Watt estimated a horse-power at 33,000 foot-pounds per minute, or 550 foot-pounds per second. This is probably too high; but it is constantly employed in engineering calculations. A curious quantity, sometimes employed as regards steam-engines, especially those employed for pumping mines, is the *duty*, which is measured by the number of foot-pounds of work done by a hundred-weight of coals supplied to the furnace. A similar mode of comparison is now applied to steam-engines for agricultural purposes, etc.

The quantity of work which can be got out of any machine, human, animal, or other, depends in many cases on the rate at which it is done, or the horse-power actually exerted. An average man can easily work at the rate of a horse-power for a few minutes at a time; but if he were to work at no other rate, he would do very little work in a day. Various singular investigations have been made, both theoretically and experimentally, as to the most profitable rate of doing work, and their results are highly interesting. But to discuss them properly would require more space than we can afford.

DESCRIPTION OF WORK.	Weight raised.	Velocity per Second.	Unit of Work per Second.	Length of Working Day.	Total Work in a Day.
	Lbs.	Feet.	Lbs. × ft.	Hours.	Lbs. × feet.
A man mounting an easy staircase, or an incline, without a load, his work consisting simply in moving the weight of his own body	143	0.5	71.5	8	2,059,200
A man raising weights by means of a cord and pulley, which renders necessary the return of the cord without a load	39.6	0.66 (say 0.67)	26.53	6	573,048
A man raising weights by his hands	44	0.56	24.64	6	532,224
A man carrying a weight on his back up an easy incline, and returning without a load	143	0.13	18.59	6	401,544
A man raising materials by a wheel-barrow, on an incline of 1 in 12, returning unloaded	132	0.065	8.58	10	308,880
A man throwing earth by a spade a height of 5 ft. 4 in	5.94	0.66 (say 0.67)	3.98	10	143,280
A man working a pin-wheel or a drum—					
1st, at the level of the axle	132	0.5	66	8	1,900,800
2d, at bottom of wheel	26⅔	2.34	61.8	8	1,779,840
A man walking and pushing, or drawing horizontally, in a continuous manner	26.4	2	52.8	8	1,520,640
A workman acting upon a winch	17.6	2.5	44	8	1,267,200
A workman pushing and pulling alternately in a vertical direction	13.2	2.5	29	10	1,044,000
A horse harnessed to a carriage going at a walking pace	154	3	462	10	16,632,000
A horse harnessed to a carriage going at a trot	96.8	7.22	699	4.5	11,323,800
A horse in a mill, at a walking pace	99.0	3	297	8	8,553,600
" at a trot	66.0	6.56	433	4.5	7,014,600
An ox in a mill, at a walking pace	132	2	264	8	7,603,200
Mule " "	66	3	198	8	5,702,400
Donkey " "	30.8	2.67	82.24	8	2,368,512

The above table, due to Poncelet, gives at least approximate notions of the horse power employed, and the whole work done, in a working day, by men and animals variously applying their exertions.

WORK, HENRY C., 1832–84; b. Middletown, Conn.; d. Hartford. When young he worked as a printer. During the civil war he wrote some songs which proved very popular; among them, *Marching through Georgia*, *Wake, Nicodemus*, and *Babylon is Fallen*. These brought him large profits which he subsequently lost. He wrote over 60 songs, and originated the music for nearly all of them. Among the most popular were *Grandfather's Clock*, *Kingdom Coming*, and *Come Home, Father*.

WORK'HOUSE, the name given to municipal institutions, in England, in which paupers are supported and maintained. The earliest mention of them is to be found in stat. 13 and 14 Car. II. c. 12, authorizing workhouses to be erected in the cities of London and Westminster, to which rogues and vagabonds might be committed, by any two members of the "workhouse corporation," a board created by the act, with the view of restraining them from predatory habits, and compelling them to work for their living. The provisions of this act were, for the first time, carried into effect in the reign of William and Mary. See PAUPERISM; POOR LAWS.

WORKING-DRAWINGS are the large plans prepared by engineers and architects to guide the workmen in executing the design. Many of these are on a large scale, all moldings and ornamental work having to be drawn out of the actual size of the work.

WORK'SOP (anciently *Wirkensop*), a t. of Nottinghamshire, England, 16 m. s.e. from Sheffield, on the right bank of the Ryton, a branch of the Idle, and near the Chesterfield canal, which communicates with the Trent. It is situated near the northern extremity of Sherwood forest. The town is generally well built, and great sanitary improvements of drainage and sewerage have recently been effected. There is a fine old church in the Norman style, with two lofty towers. Worksop was formerly noted for its Augustine monastery, of which there are now few remains. Much barley is grown in the neighborhood, and malting is carried on to a great extent. There is some trade in flour, timber, etc. Worksop is a station on the Manchester, Sheffield, and Lincolnshire railway. Pop. '81, 11,625; '91, 12,734.

WORLD'S COLUMBIAN EXPOSITION. The official title of the great Exposition held at Chicago in 1893 to commemorate the discovery of the western hemisphere by Christopher Columbus.

INCEPTION.—The first formal steps toward the organization of such a celebration were taken in 1885, when the directors of the Interstate Exposition at Chicago passed resolutions looking to this end (November 18th). In July, 1886, Senator Hoar of Massachusetts introduced into the United States Senate a bill providing for a Columbian Exposition to be held at Washington in 1892. Many other plans and projects now began to find supporters in various parts of the country, but they all crystallized into the first bill offered in Congress by Senator Cullom of Illinois in December, 1889. An exciting contest at once began among the various cities of the country for the honor of securing the Exposition, but it soon narrowed down to a struggle between Chicago and New York, and on February 24th, 1890, Chicago was definitely selected. In order to win this distinction, that city was required to furnish an acceptable site, and to pledge the enormous sum of $10,000,000.

On July 2d, 1890, the Directors and the National Commission selected and approved a site whose beauty and extent are as yet unmatched in the history of international exhibitions. It was then part of the South Park system of Chicago known as Jackson Park and the Midway Plaisance, comprising nearly 700 acres fronting on Lake Michigan for a mile and a half, semicircled by trees and shrubbery, and offering possibilities which the taste and ability of the management developed to the full. The Midway Plaisance is a strip which forms a connecting link between Jackson and Washington Parks. It is one mile long and 600 feet wide, thus giving an additional area of 72 acres.

ORGANIZATION.—The management of the World's Columbian Exposition may be described as having been vested in four organizations: The National Commission, authorized by Congress; the World's Columbian Exposition, organized under the laws of the State of Illinois; the Board of Lady Managers, authorized by Congress; and the World's Congress Auxiliary. The National Commission was composed of eight commissioners-at-large with alternates; two commissioners from each State, Territory, and the District of Columbia—one Democrat and one Republican—appointed by the President on the nomination of their respective governors. This Commission, when not in actual session, delegated its authority to eight of its members, who, with a like number selected from the World's Columbian Exposition, constituted a Board of Reference and Control. The officers of the Commission were: President, Thomas W. Palmer; vice-presidents, Thomas M. Waller, M. H. de Young, D. D. Penn, G. W. Allen, and Alexander B. Andrews; secretary, John T. Dickinson. The World's Columbian Exposition was a company of about 30,000 stockholders organized under a charter from the State of Illinois. The stockholders elected annually a Board of Directors of forty-five, citizens of Chicago. On this body fell the burden of raising the necessary money and of the active management. Its first president was Lyman T. Gage. During the progress of the Fair its officers were: President, Harlow N. Higinbotham; vice-presidents, F. W. Peck, R. A. Waller; secretary, H. O. Edmonds; solicitor, Edwin Walker.

The Board of Lady Managers was composed of two members with alternates from each State and Territory, and of nine from the city of Chicago. It had the supervision of the participation by women in the Exposition and of all the exhibits made by women. Its officers were: President, Bertha Honoré Palmer (Mrs. Potter Palmer); secretary, Susan Gale Cooke.

The World's Congress Auxiliary was organized for the purpose of holding a series of congresses to supplement the exposition that was made of the material progress of the world by a portrayal of the achievements in science, literature, education, government, jurisprudence, morals, charity, art, religion, and other branches of mental activity. The Hon. C. C. Bonney, of Chicago was president of the Congress Auxiliary, aided by the Hon. Thomas B. Bryan.

George R. Davis, of Chicago, was Director-General of the entire Exposition, and therefore its chief executive officer.

The most important bureau in connection with the World's Columbian Exposition was undoubtedly the Bureau of Construction. Of this Bureau D. H. Burnham was chief; Edward C. Shankland chief engineer; and F. L. Olmsted landscape architect.

The heads of the various departments of the Exposition were as follows:

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HORTICULTURAL AND ILLINOIS STATE BUILDINGS.

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Agriculture: W. I. Buchanan; *Horticulture:* John M. Samuels; *Live-stock:* W. I. Buchanan; *Fish and Fisheries:* John W. Collins; *Mines and Mining:* F. J. v. Skiff; *Machinery:* L. W. Robinson; *Transportation:* Willard A. Smith; *Manufactures:* James Allison; *Electricity:* John P. Barrett; *Fine Arts:* Halsey C. Ives; *Liberal Arts:* Selim H. Peabody; *Ethnology:* F. W. Putnam; *Forestry:* W. I. Buchanan; *Publicity and Promotion:* Moses P. Handy; *Foreign Affairs:* Walker Fearn.

CONSTRUCTION.—Some idea of the magnitude of the Exposition may be gained from the following statement of some items of the cost of construction and operation, exclusive of the buildings:

Object.	Cost.
Dredging, Filling, and Excavating	$615,254
Landscape Gardening	492,962
Viaducts and Bridges	120,998
Fountains	140,080
Piers and Breakwaters	326,394
Waterway Improvements	279,255
Railways	659,329
Steam Plant	858,436
Electric Plant	1,233,687
Seats for Grounds	14,868
Water Supply and Sewerage	1,001,316
World's Congress Auxiliary	76,005
Police Protection	1,334,373
Fire Protection	263,095
Janitor Service	212,455
Pyrotechnical Displays	103,141
Music	387,371
Total	$8,792,122

The following sums were expended in the construction of the principal buildings belonging to the Exposition proper:

STATEMENT OF DIMENSIONS, AREAS AND COST OF THE BUILDINGS AT THE WORLD'S COLUMBIAN EXPOSITION, 1893.

BUILDINGS.	Dimensions in Feet.	Area in Acres.	Approximate Cost.
Administration	256 x 256	1.274	$476,529
Agricultural	500 x 800	18.457	699,316
Agricultural Annex	312 x 550		
Art Gallery	320 x 500	6.625	758,781
Art Gallery Annexes—two—each	222 x 136		
Electricity	345 x 671	10.075	447,762
Fisheries	165 x 365	2.672	235,008
Fisheries Annexes—two—diameter	135		
Horticultural	251 x 998	5.491	311,611
Manufactures and Liberal Arts	1687 x 787	44.674	1,817,361
Machinery	492 x 842	19.131	1,282,416
Machinery Annex	492 x 500		
Machinery, Boiler House, and Tool House	1216 x 85		
Mines and Mining	364 x 714	8.346	292,947
Transportation	256 x 960	17.961	554,770
Transportation Annex	801 x 455		
Woman's	199 x 398	4.08	138,623
Anthropology	255 x 415	4.106	87,612
Forestry	208 x 528	2.529	83,289
Shoe and Leather	150 x 574	3.281	93,243
Dairy	95 x 200	.783	27,055
Casino and Music Hall—each	256 x 139	3.375	318,013
Peristyle			
Colonnade and Obelisk			101,495
Terminal Station	163 x 458	5.765	290,031
Perron	85 x 672		
Railway Sheds		2.4	
La Rabida, Children's Service, Choral, Public Comfort, Colonnade,		5.501	223,186
Stock Pavilion	280 x 440	2.43	67,475
Dairy and Stock Barns		10.81	142,951
Miscellaneous			1,396,192
United States Government Building	351 x 421	4.00	400,000
Imitation Battleship	69 x 348	.60	100,000
Total		184.366	10,345,666

The selection of Jackson Park as the site of the Exposition was due to the distinguished landscape gardener, Mr. Frederick Law Olmsted, and his former partner, Mr. Henry Sargent Codman. The choice which they made at first excited surprise. Jackson Park in July, 1890, was a dreary stretch of bog, partly covered by tangled undergrowth and scrub-oak, and noticeable only for its unrelieved ugliness. Its possibilities, however, were plainly evident to the trained eyes of the Commission, and, above all, its proximity to the lake. In the spring of 1891 an army of laborers began the operations that in a few months utterly transformed the appearance of the place. Bogs were drained, the undergrowth and trees removed, canals, lagoons, and basins were cut, long slopes of greensward laid out, and flowers and shrubs lavishly planted. The water of the lake was brought in to touch the site of every one of the great buildings for whose foundations all was ready by June of the same year.

These structures, as originally planned, were ten in number: the buildings for Manufactures and Liberal Arts, Administration, Machinery, Agriculture, Electricity, Mines, Transportation, Horticulture, Fisheries, and the Venetian Village. At this time it was the purpose of the Exposition to establish the exhibit of fine arts upon the Lake Front Park. This plan being subsequently abandoned, the Art Galleries and the Woman's Building were the first of the later structures to find a place upon the plan. As the importance of the work gradually developed, necessity for additional space became clear, and the ten original buildings quickly secured neighbors in the Forestry, Dairy, Stock Pavilion, Terminal Station, Music Hall, Peristyle, Casino, Choral, Anthropological, and so on throughout a list of great and small, until there were nearly three hundred separate and distinct structures under roof in Jackson Park, not including the scores of minor pavilions and shelters of a less important character, built by concessionaires, exhibitors, and others. When those of the Midway Plaisance were added, the total was increased to about four hundred.

The designs were not secured by competition, many reasons existing against the adoption of such a method, the time being short and the work great. Direct selection was, therefore, the method adopted, and the buildings were allotted by the Chief of Construction as follows: Administration, Richard M. Hunt, of New York; Transportation, Adler and Sullivan, of Chicago; Manufactures and Liberal Arts, George B. Post, of New York; Mines, S. S. Beman, of Chicago; Agriculture, McKim, Meade and White, of New York; Venetian Village, Burling and Whitehouse, of Chicago; Machinery, Peabody and Stearns, of Boston; Horticulture, W. L. B. Jenney, of Chicago; Electricity, Van Brunt and Howe, of Kansas City; Fisheries, Henry Ives Cobb, of Chicago. Late in the spring of 1891, after the other buildings were designed and nearly ready for construction, Mr. Charles B. Atwood entered upon his labors with the Exposition, and to him are due the beautiful Art Building; the Peristyle, Music Hall, and Casino; the imposing Terminal Station; the Forestry, Dairy, and other buildings, in addition to his important work as Designer-in-Chief. The Stock Pavilion was planned by Messrs. Holabird and Roche, of Chicago. In unrestricted competition the plan of Miss Sophia G. Hayden was selected for the Woman's Building. The Venetian Village at the end of the great pier being abandoned, Mr. Whitehouse's services were retained for the Choral Building.

A very ingenious choice of building material was made in the selection of a species of plaster called "staff" of a brown color, but when painted white possessing a perfect resemblance to marble. It was, therefore, not only beautiful in its effect, but also inexpensive and easy to work in, so that it was finally utilized not only for the buildings, but for balustrades, basins, ornamental work, and even for statuary—the effect being startling in its pure color, whose predominance gave to the Exposition when finally completed its popular name "the White City."

The buildings of the Fair were designed to fall under three general groups. Those about the Grand Basin—the Administration, Manufactures, Agriculture, Machinery, Electricity, Mines and Art Building—were essentially dignified in style: those lying farther to the north—the Horticultural, Transportation, and Fisheries—being less formal, blended readily with the more or less homelike buildings of the States and foreign governments, which were grouped among the trees of the extreme northern portion of the grounds. Upon the Midway Plaisance no distinct order was followed, it being instead a collection of almost every type of architecture known to man, all combining to form the lighter and more fantastic side of the Exposition.

The chief buildings will be described more in detail in another part of this article.

Publicity.—Among the first and most important Departments of the Exposition to be organized was that of Publicity and Promotion, whose duty it was to make the project known to the people of every civilized nation in the world. The enormous task devolving upon the Department, whose head was Major Moses P. Handy, was begun in December, 1890. Mr. Robert E. A. Dorr, the Assistant Chief of the Department, has given an interesting description of the system adopted, from which the following paragraphs are taken:

"Circulars were sent to every diplomatic and consular representative of the United States telling briefly of the Exposition and its national character; soliciting friendly aid in disseminating information; announcing that the minister or consul would receive a weekly budget from the Fair; and requesting that a list of desirable people to interest in his district be sent at once to the Department.

"A list of nearly five thousand newspapers published in foreign lands was made out, wrappers and envelopes addressed, and a weekly news-letter suited to the character of the publication and in the language of the country was dispatched.

"The American diplomats and consuls responded promptly, and in less than two months a foreign mail-list of individuals, government officials, merchants, bankers, manufacturers, and business firms, aggregating 10,000 names, was duly registered, classified, and indexed in the books of the department, and the weekly news-budget soon became an embarrassing factor in the already overcrowded and overworked Chicago post office.

"While this was being done the home field was not neglected. Circulars were sent to every representative newspaper in the United States and Canada (about thirty thousand) telling that a weekly news-letter would issue from the Department, and that such publications as would write asking for it would be supplied without charge. The names and home addresses of the members of thirty-five State legislatures were secured; of all other State and Territorial officials; of the Senate and House of Representatives of the United States; and of prominent men and women in nearly every pursuit of life. The result was a domestic mail-list containing about fifty thousand names."

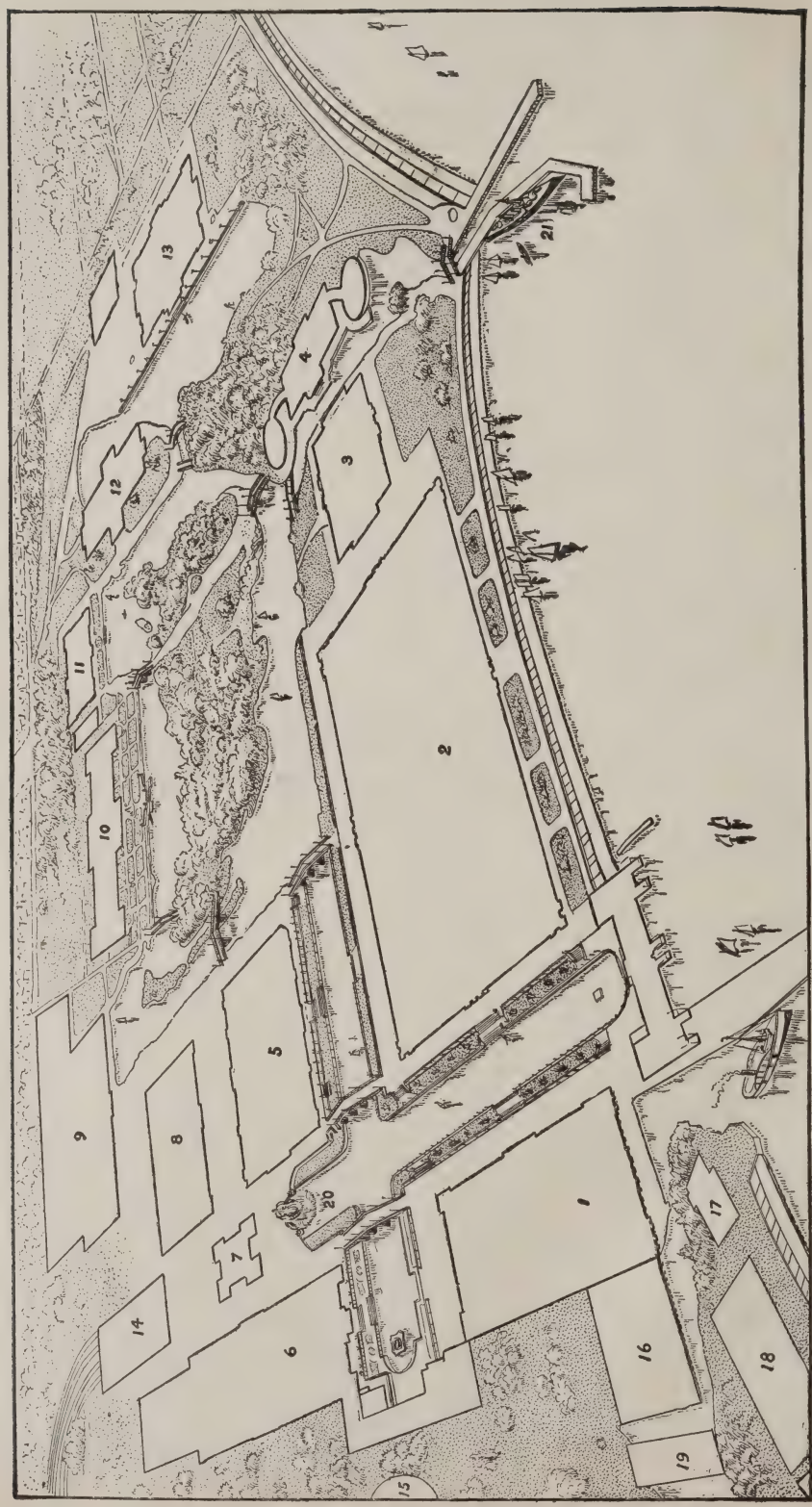
Circulars and documents in fifteen languages were sent out by the Bureau. Every week a budget of paragraphs was mailed to the 60,000 names, domestic and foreign, on the mailing list, at an expense of $600 per week. A very important method of advertising the Fair was in the colored pictures showing the grounds and buildings and lithographed from a design furnished in water-colors by Mr. Charles Graham. These pictures were printed in nineteen colors and tints, and were the finest specimens of the lithographer's art ever produced in this country. One hundred thousand copies, costing $20,000, were mailed to all parts of the world, at an expense for postage of more than $6000.

Participation.—The work of the Department of Publicity and Promotion, aided by the services of the ministers and consuls of the United States, was so effectively done, that a fuller representation of foreign countries was secured for the Columbian Exposition than any previous World's Fair had ever witnessed. The following list shows the nations and colonies that took part, and the sums appropriated by their governments for the purposes of their representation, the sums being reduced to American money:

Argentine Republic	$100,000
Austria	110,000
Belgium	57,000
Bolivia	30,000
Brazil	600,000
Colombia	50,000
Costa Rica	150,000
Denmark	67,000
Danish West Indies	1,200
Ecuador	125,000
France	733,000
Germany	800,000
Great Britain	291,000
British Guiana	25,000
British Honduras	7,500
Canada	450,000
Cape Colony	50,000
Ceylon	125,000
Jamaica	24,333
New South Wales	150,000
New Zealand	27,500
Trinidad	15,000
Greece	60,000
Guatemala	200,000
Hawaii	40,000
Haiti	25,000
Japan	630,000
Liberia	7,000
Mexico	50,000
Netherlands	100,000
Dutch Guiana	10,000
Dutch West Indies	5,000
Norway	56,280
Orange Free State	7,500
Paraguay	100,000
Persia	12,000
Russia	46,320
Spain	200,000

The States of the Union responded generously to the invitation sent them. The subjoined list shows the amounts appropriated by them for the purpose.

Alabama	$38,000
Arizona	30,000
Arkansas	55,000
California	550,000
Colorado	167,000
Connecticut	75,000
Delaware	20,000
Florida	50,000
Georgia	100,000
Idaho	100,000
Illinois	800,000
Indiana	135,000
Iowa	130,000
Kansas	165,000
Kentucky	175,000
Louisiana	36,000
Maine	57,000
Maryland	60,000
Massachusetts	175,000
Michigan	275,000
Minnesota	150,000
Mississippi	25,000
Missouri	150,000
Montana	100,000
Nebraska	85,000
Nevada	10,000
New Hampshire	25,000
New Jersey	130,000
New Mexico	35,000
New York	600,000
North Carolina	45,000
North Dakota	70,000
Ohio	200,000



World's Columbian Exposition. General Plan.

Cuba	$25,000
Sweden	108,000
Switzerland	36,000
Uruguay	24,000

It is estimated that various foreign governments spent, in addition to these amounts, the sum of $2,000,000 in behalf of their exhibitors.

Oklahoma	$17,500
Oregon	60,000
Pennsylvania	360,000
Rhode Island	57,500
South Carolina	50,000
South Dakota	85,000
Tennessee	25,000
Texas	40,000
Utah	50,600
Vermont	39,750
Virginia	75,000
Washington	100,000
West Virginia	40,000
Wisconsin	212,000
Wyoming	30,000
Total	$6,060,350

KEY TO PLAN ON OPPOSITE PAGE.

1. Agricultural Building.
2. Manufactures and Liberal Arts Building.
3. United States Government Building.
4. Fisheries Building and Deep Sea Aquaria.
5. Electrical Building.
6. Machinery Hall, Annex, etc.
7. Administration Building.
8. Hall of Mines and Mining.
9. Transportation Exhibit.
10. Horticultural Hall and Greenhouses.
11. Woman's Building.
12. Illinois State Building.
13. Galleries of Fine Arts.
14. Railway Approach.
15. Part of 63 Acres Reserved for Live Stock.
16. Assembly Hall and Annex to Agricultural Building.
17. Convent La Rabida.
18. Forestry Building.
19. Dairy Building.
20. Fountain.
21. United States Naval Exhibit.

Principal Buildings.—(1) *The Administration Building*, the most conspicuous structure of the Exposition, was designed by Mr. Richard M. Hunt, of New York. Its principal body was octagonal in shape, surmounted by a great dome enclosing an inner one. The octagon was pierced at right angles by four spacious entrances opening into a magnificent reception hall. At the four corners were the pavilions containing the offices of the various administrative departments. The rotunda in the heart of the building was arched over by the inner dome with a finely panelled and decorated ceiling. At the centre was an opening through which could be seen the frescoes of the greater dome, whose skylight at the very apex flooded the whole rotunda with light. The dome was circled on its interior by a gallery 100 feet above the floor, and this gallery gave access to a colonnade surrounding the whole dome without, from which a charming panorama of lakes, fountains, terraces, and countless other domes and minarets were visible beneath the eye. The exterior of the building was highly ornate, the cornices of the pavilions and the piers of the loggia story being lavishly supplied with splendid groups of statuary designed by Karl Bitter. The fresco paintings were the work of Mr. William Leftwich Dodge.

(2) *Transportation Building.*—This very striking building, the only one with polychromatic decoration, was designed by Messrs. Adler and Sullivan, of Chicago. It was in the form of three long halls or sheds, measuring in all 256 by 960 feet and having a floor area of more than nine acres. An annex measured 425 by 900 feet, with nine and a quarter acres of floor area. A cupola, somewhat too small in proportion to the size of the building, rose above it. The architecture was suggestive of the Romanesque, though simple, the most striking feature of the whole building being the main entrance, known as "the Golden Doorway." This was formed by an immense single arch treated wholly in gold-leaf and enriched by carvings, reliefs, and mural paintings. Minor entrances also pierced the walls, and with them were grouped statuary, drinking fountains, and terraces. The interior of the building was modelled somewhat after a Roman basilica, with a broad nave and narrower aisles. The exhibits collected here included everything that could possibly be devoted to the purpose of transportation, from railway-engines, ocean-steamers, and balloons, to cash-conveyers. The statuary of the building, including figures of great inventors, such as Watt, Stephenson, Montgolfier, etc., was the work of Mr. John J. Boyle, of Philadelphia.

(3) *The Mines and Mining Building* was designed by Mr. S. S. Beman, of Chicago. It was 714 feet long and 350 feet wide, and represented a type of the early Italian Renais-

sance modified by French treatment, simple and regular. Its principal fronts had enormous arches overhanging the entrances, and these were richly decorated with sculptural groups and other embellishments symbolical of mining and its kindred industries. The building overlooked the Great Central Court on the south, and the western and middle lakes on the north. In it were displayed 209 classes of exhibits, comprising all kinds of metals, apparatus for mining, illustrations of metallurgical processes, assaying apparatus, and the history and literature of mining and metallurgy.

(4) *Machinery Hall* was designed by Messrs. Peabody and Stearns, of Boston. It represented a blending of the best types of the Spanish Renaissance, and was unsurpassed by any building in the Exposition in its graceful and harmonious proportions. At the first story a covered loggia furnished a promenade which encircled the whole building. This was coated with staff and stained a delicate ivory tint contrasting beautifully with the colors and gold-finish of much of the exterior. The building was ornamented by a number of striking groups of statuary of heroic size by Mr. M. A. Waagen, representing among other subjects "Science," and the four elements, "Earth," "Air," "Fire," and "Water," besides "Columbia," "Honor," and "Wealth." In Machinery Hall were placed 86 classes of exhibits, including specimens of every form of mechanical invention. Most striking among them were the huge Allis engine of 2000 horse-power running two dynamos, each lighting 10,000 incandescent lights; the remarkable printing exhibit; and the immense travelling crane which moved the enormous masses of machinery. Machinery Hall contained seventeen acres of floor area.

(5) *The Agricultural Building* was an attractive structure 800 feet long and 500 feet wide, with a floor area of nearly nineteen acres. It stood near the shore of the lake and was in the shape of the letter T, having only a single story. The architects were Messrs. McKim, Meade and White, of New York. Mr. Philip Martiny, of Philadelphia, designed most of the sculptured groups; Mr. Larkin G. Mead, of Florence, Italy, the Ceres-pediment over the main entrance; Mr. George W. Maynard, of New York, superintended the painted decorations, which were in the Pompeian style. The decoration was in one respect quite unique in choosing subjects so purely American as maize, the potato, the tobacco-plant, and especially the wild turkey which was shown on the cornices about the dome.

(6) *The Electricity Building* was designed by Messrs. Van Brunt and Howe, of Kansas City. Its dimensions were nearly the same as those of the Mining Building, to which it lay parallel. It was a finely delicate structure, with ten towers (*campanile*) and four domes. Its façades were composed of Corinthian pilasters. The main entrance on the south was conceived as a solid pylon pierced by a triumphal arch 92 feet in height and 58 feet wide, framing a great semicircular niche in which stood a colossal statue of Benjamin Franklin. The exterior of the building, besides purely conventional decorations, exhibited devices indicative of its purpose, such as electro-magnets, lamps, etc. The statuary was the work of the Danish sculptor, Carl Rohl-Smith. The electrical display was one of the most attractive features of the whole Exposition. At evening especially the illumination of the buildings, the fountains, and the lagoons by thousands of brilliant lights which gleamed and glistened and threw rainbows of color over the pure white of the domes and towers, proved a never-ending source of wonder and delight.

(7) *The Art Building* was designed by Mr. C. B. Atwood, of Chicago. It was a beautiful specimen of Ionic architecture, measuring 500 by 320 feet, with an intersecting nave and transept crossing the building, and a pedestal at the point of intersection. This pedestal, which for a while displayed a colossal statue of the Winged Victory, was subsequently removed as too heavy. The building had four noble entrances richly decorated with sculptures, and each approached by a broad sweep of steps. Along the several façades ran colonnades. The effect of the whole structure, with its graceful pillars, porches, and picturesque gables, was remarkably beautiful. The main entrance and also the exterior frieze exhibited portraits of the great masters, and were rich with decorative sculpture in bas-relief. This building was constructed with a view to permanent preservation as a feature of the park, and was therefore strongly constructed of brick faced with staff, and having galleries, floors, and roof of iron. The general tone of the exterior is a gray. The whole edifice was fire-proof. On the ground floor statuary was exhibited, and paintings hung upon the walls of both this floor and of the galleries. Over the globe which surmounted the dome was Martiny's winged figure representing Fame. The entrances of the building were guarded by huge lions designed by Messrs. Theodor Baur and A. P. Proctor.

(8) *The Woman's Building* was designed by Miss Sophia G. Hayden, of Boston, and is in the style of the Italian Renaissance. Other ladies took part in the decorations, among them Miss Yandell, of Louisville, who modelled the caryatides; Miss Alice Rideout, of San Francisco, who designed the figure groups on the roof-line; Mrs. Dora Wheeler Keith, of New York, who painted the ceiling of the beautiful library; and Mrs. MacMonnies, whose large composition, representing Primitive Women, was placed at the north end of the gallery, opposite to one by Miss Cassatt representing

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MACHINERY HALL.

ADMINISTRATION BUILDING.

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MANUFACTURES AND LIBERAL ARTS BUILDING.

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Modern Women. The dimensions of the Woman's Building were 199 feet by 398. The building was devoted to exhibits illustrating the work of woman in almost every department of science, art, and industry, which were sent from all the quarters of the earth.

(9) *The United States Government Building* was designed and constructed under the direction of Mr. W. J. Edbrooke, of Washington, D. C., supervising architect to the United States Treasury. It was of the modern Renaissance style, and covered an area of 350 by 420 feet, being surmounted by a dome 275 feet in height. It was used for the exhibits sent by the State, Treasury, Navy, War, Interior, Post Office, Agricultural, and Judicial Departments and the National Fish Commission. It was built from an appropriation of $400,000 made by Congress for the purpose. The situation of the building was one of the finest on the grounds, its eastern façade looking upon Lake Michigan, and its western face fronting the lagoon and the Wooded Island. The building was very substantial, being constructed of brick, iron, and glass, and was largely modelled upon the great Government buildings at Washington, the central dome, in particular, recalling that of the Capitol. No finer collection of exhibits was to be found at the Exposition than that sent by the National Government, and none was more systematically and thoroughly arranged. Its most striking features were the fisheries exhibit, the fine collection of cannon and fire-arms, the magnificent transparencies representing the mountain and cañon scenery of the Far West, the beautiful collection of geological specimens, brilliant in color and exquisite in the taste of their combination—fluorite, malachite, tourmaline, beryl, chalcopyrite, and many others—the sections of the great California trees, and especially the great full-size model of a battle-ship—the Illinois—built of brick, in the lake near by, but covered with armor-plate, and finished, armed, and equipped as the original vessel will be when completed.

(10) *The Horticultural Building* was designed by Messrs. W. L. B. Jenney and W. B. Mundie. Its dimensions were 998 by 250 feet, with a glazed dome in the centre 114 feet high and 180 feet in diameter. The style was of the Venetian Renaissance with the Ionic order, and exquisite sculptured decorations by Mr. Lorado Taft, assisted by his pupil, Miss Julia Bracken. The frieze around the inner surface of the dome, displaying festoons and garlands of the passion-vine, was painted by Mr. C. C. Coleman. Under the dome in the central pavilion was a miniature mountain, under which was a reproduction of the great Crystal Cave in the Black Hills of South Dakota. In the Horticultural Building nearly every remarkable flower and plant of the world found a representative.

(11) *The Building of Manufactures and Liberal Arts* was not only the largest building in the world, but the largest building that has ever yet existed under a roof, being four times as large as the Colosseum at Rome, which could seat 80,000 people, and three times as large as St. Peter's. Its central hall alone could seat 75,000 people, and allow to each one fully six square feet of space. In building it, 17,000,000 feet of lumber, 13,000,000 pounds of steel, and 2,000,000 pounds of iron were used. Its cost was $1,800,000. To fasten the lumber of the flooring to the joists required five carloads of nails. The iron and steel in the roof alone would build two bridges, each the size of the great Brooklyn Bridge. The whole standing army of the Russian Empire could be mobilized under its roof. The architect of this remarkable edifice was Mr. George B. Post, of New York, who showed in his motive a wonderful conception of the architectural means necessary to enable the spectator to receive at once the full impression of the vastness of its proportions. The treatment was severely simple, and the immensity of the structure was not broken and its gigantic proportions were not frittered away by porches, carvings, and balconies; but the gigantic size of the building as a whole was made to smite the mind through the eye at the first glance, and to thrill it with a sense of stupendous achievement. It was in this hall that the Exposition was first dedicated by Vice-President Morton acting for President Harrison (October 21, 1892). The fine Hall of Arches was added to the original design, by Mr. E. C. Shankland, the engineer. The myriad of exhibits that filled this colossal structure comprised those relating to physical training, education, government and law, religion, music, commerce, literature, manufactures, architecture, and engineering, all being minutely subdivided with scientific precision and intelligent system.

Minor Buildings and Special Objects of Interest.—Very picturesque were the buildings erected on the grounds of the Exposition by the various foreign governments, and representing many varieties of national architecture. Noticeable were the *German Government Building*, designed by Johannes Radke, of Berlin, at a cost of $250,000, to suggest the quaint South German architecture, such as still renders Nuremberg so attractive to the traveller; the *Swedish Building*, by Wickman, of Stockholm, in the style of the Swedish manor-houses of the sixteenth century; the *French Building*, with a colonnade and court beautifully decorated with bronzes; the *Venezuelan Building*, of pale green staff; the *Ceylon Building*, of teak, with a beautifully carved façade and roof; the *English Building*, known as "Victoria House"—a typical specimen of an old manor-house of the time of Henry VIII.—and the *Spanish Building*, with its interesting collection of Columbian relics.

Interesting also were many of the houses erected by the various States of the Union, each intended to be a sort of rendezvous for the visitors from those States. The most elaborate were the *Illinois State Building*, in the form of a Greek cross and with a fine dome; the *Pennsylvania State Building*, a stately colonial edifice reproducing the clock-tower of Independence Hall, Philadelphia, and containing in its exhibition-room among other relics the famous Liberty Bell; the *New York Building*—a truly palatial structure, covering an area of 14,538 square feet, besides porticoes, terraces, etc., of nearly 4000 additional square feet; the *California Building*, in the Spanish style; the *Virginia Building*, a reproduction of the Washington mansion at Mt. Vernon; the *Ohio Building*, in the Italian style; the *Indiana Building*, Gothic, with cathedral windows and towers; the *Missouri Building*, massive and commodious; the striking *Idaho Building*, a sort of glorified log-cabin of cedar; and the unique *Florida Building*, which was a reproduction of the old Spanish stronghold, Fort Marion, at St. Augustine, and was justly regarded as historically one of the most interesting objects of the whole Exposition. Many of the other State buildings were handsome and costly, but presented no features that call for especial mention.

A very remarkable Columbian memorial was the *Convent of Santa Maria de la Rábida*, a fac-simile of the monastery, near Palos in Spain, famous in the history of Columbus as having been his asylum and residence during the dark days preceding the final success of his appeal to the sovereigns of Castile. This replica of what one writer has called "the corner-stone of American history" was erected at a cost of $50,000, and contains a large number of interesting historical souvenirs, among them all the original relics of Columbus now existing, including every portrait of Columbus that has ever been painted or engraved, with models or photographs of every monument or statue erected in his honor.

A remarkably artistic composition and one of the most admired sights of the Exposition was the *MacMonnies Columbian Fountain*, on the verge of the Main Basin and fronting the Administration Building. It was designed and executed by Mr. Frederick MacMonnies, of Paris. It represented a mediæval barge surrounded by sea-horses and water-nymphs. Above it sat Columbia enthroned, with Fame in the bow proclaiming, with a herald's trumpet, freedom and renown. Four female figures symbolizing the arts and sciences handled the oars, and Time sat at the helm. The brilliant illumination of this fountain at night by the electric lights furnished a fairy-like spectacle, the myriad jets and the spray of the fountain taking on innumerable tints and colors. Flanking this exquisite group were two other fountains with basins 60 feet in diameter and each having 152 jets of water. When all were illuminated at once by the electric light, a bewildering combination of color and form resulted, resembling a shower of rubies, emeralds, and amethysts falling through a golden mist. The cost of the two auxiliary fountains alone was $100,000, and the nightly cost of operating and illuminating them was nearly $1000. It was from the MacMonnies Fountain facing eastward to the lake that the finest view of the whole Exposition was presented to the eyes of the visitor. Before him lay the *Grand Court of Honor*, approached from the lake under the majestic *Peristyle* designed by Mr. Atwood, with its long stretch of 48 graceful Corinthian columns and surrounded by the four architectural wonders of the Fair, with a bewildering vista of glistening domes, minarets, spires, and statues, revealing an indescribable blending of color against the pure white of the Exposition's palaces and the blue of the summer sky. Opposite the three fountains and at the other end of the Basin stood the colossal *Statue of the Republic*, an heroic figure, by Daniel Chester French, 65 feet in height and resting upon a pedestal of 35 feet. The figure was that of a woman draped in a Greek robe, crowned with laurel, holding in one uplifted hand a staff with the conventional Phrygian cap, and in the other a globe surmounted by an eagle. The open robe revealed a mailed breastplate and a sword girt about the waist. The figure was of staff and richly gilded. Over the water-gate of the Basin was a huge *Quadriga* representing the Triumph of Columbus. Through the arch of the Peristyle access to Lake Michigan was given to the small pleasure-craft that swarmed in the lagoons of the Exposition, among which the most striking were the Venetian gondolas that dotted the water everywhere. At the north end of the Peristyle was a fine *Music Hall* in the style of the Roman Renaissance, with an auditorium capable of seating 2000 people.

Among the other sights of the Exposition that possessed a rare degree of novelty was the great *Ferris Wheel* in the Midway Plaisance. This remarkable wheel was to the Columbian Fair what the Eiffel Tower was to the Paris Exposition of 1889. It was built of steel throughout, and resembled an enormous bicycle-wheel hung between two towers. Its height was 264 feet, and it consisted of two skeleton wheels 28 feet apart, bound fast together by strong shafts of steel. Between the outer rims of this gigantic frame were suspended 36 cars balanced upon trunnion-pins and holding 60 passengers each. The wheel revolved upon an axle 45 feet long and 33 inches in diameter—the largest steel forging ever made—and the motive power was furnished by two engines of 2000 horse power.

Much attention was attracted by the various representations of foreign life given in

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ELECTRICITY. LOOKING DOWN THE CANALS FROM THE OBELISK. AGRICULTURE.

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the Plaisance, among them *Old Vienna*, a reproduction of the Graben as it was some 200 years ago; the *Irish Village*, created under the direction of the Countess of Aberdeen; the *Dahomey Village;* the *German Village*, with its feudal castle side by side with the quaint mediæval farm-houses; the *Dutch Settlement*, illustrative of the South Sea Islands; the *Turkish Village*, reproducing a street in Constantinople; and especially the *Cairo Street*, identical with the Rue de Caire of the Paris Exposition of 1889, and extremely popular for the realism of its Oriental scenes. Near the Convent of La Rábida were moored the three *caravels* which reproduced the three vessels that Columbus commanded in 1492. These were sent by Spain, and had taken part in the great naval review in New York. In South Pond was the *Viking Ship* from Norway.

A Brief Chronicle of the Exposition.—The Exposition was dedicated by Vice-President Morton, October 21, 1892, in the presence of fully 250,000 people. The dedication address was by Mr. Chauncey M. Depew, of New York, and the ode by Miss Harriet Monroe, of Chicago. On May 1, 1893, the Fair was formally opened by President Cleveland. The Director-General, Col. George R. Davis, delivered an oration, and a poem was read by Mr. W. F. Croffut. The Duke of Veragua, a lineal descendant of Columbus, who had arrived in New York on April 14, was present at the opening as the guest of the city of Chicago. On May 18 the Princess Eulalia, aunt of the King of Spain, reached this country, and soon after proceeded to Chicago as Spain's official representative. On September 11 the Parliament of Religions was opened. October 9 was celebrated as Chicago Day; October 21, as Manhattan Day. On October 30 the Exposition was declared officially closed, the intended ceremonies having been omitted owing to the death by assassination of the Mayor of Chicago, Mr. Carter H. Harrison. The removal of the exhibits was at once begun, as also the gradual demolition of the buildings. On January 8, 1894, a fire, starting in the Casino, swept away the Peristyle, the Music Hall, and the Casino itself.

Attendance, Receipts, etc.—The following tables will be of interest as showing the attendance in each month, and upon some of its commemoration days; and also the statistics of the attendance when compared with that of other great Expositions.

ATTENDANCE AT THE FAIR.

Months.	Passes.	Paid.	Total.	Months.	Passes.	Paid.	Total.
May	481,947	1,050,037	1,531,984	September	1,149,071	4,659,871	5,808,942
June	962,721	2,675,113	3,577,834	October	1,128,995	6,818,884	7,945,430
July	1,217,239	2,760,263	3,977,502				
August	1,172,315	3.515,493	4,687,708	Total	6,052,188	21,479,661	27,539,041

This is exclusive of the paid attendance prior to the opening and after the closing of the Fair.

SPECIAL DAYS.

July 4—Independence day	283,273	October 21—Manhattan day	298,928
October 9—Chicago day	716,881	October 12—Italian day	275,217
October 10—North-Dakota day	309,294	October 27—Coal, grain, and lumber day	254,763
October 11—Connecticut day	309,277		

COMPARATIVE STATISTICS.

Expositions.	Total Attendance.	Expositions.	Total Attendance.
Vienna, 1873	7,254,687	Paris, 1889	28,149.353
Philadelphia, 1876	10,164,489	London, Colonial, and Indian, 1886	5,550,745
Paris, 1878	16,032,725	Chicago, 1893	27,539,041

Thus it will be seen that only one Exposition has ever been more largely attended,—the Paris Exposition of 1889.

From the Auditors' balance sheet for December 31, 1893, the following summary of the finances of the Exposition is compiled.

Receipts from stock	$5,606,495.69	
City of Chicago	5,000,000.00	
United States (souvenir coins)	2,446,699.43	
Admissions at gates	10,601,279.91	
Concessions and other sources	4,769,465.38	$28,423,940.41
Expenses for construction	18,511,618.18	
For operation	8,234,802.31	26,746,420.49
Balance unexpended		1,677,519.92

Against which some minor liabilities remained for payment.

An official history of the Exposition has been promised by the management. The first volume of an account of the remarkable Congress of Religions appeared in December, 1893, edited by the Rev. Dr. Barrows, of Chicago. A popular summary of the Exposition, though with a good many inaccuracies of detail, is Messrs. Rand and McNally's *Week at the Fair* (Chicago, 1893). A free series of reports of the Exposition, with a sum-

mary of the proceedings of the various Congresses and Parliaments is now in course of preparation. It will be published by the United States Government, and will fill some twenty large volumes. No such official and complete statement has ever been published with regard to any other of the great expositions, and it is thought that this will be of great statistical and historical value. A fine series of articles by various writers of distinction, including Walter Besant, Paul Bourget, Samuel L. Clemens, H. H. Boyesen, John J. Ingalls, and Arthur S. Hardy appeared in the *Cosmopolitan Magazine* for December, 1893, with many fine illustrations from photographs.

WORM FEVER is a popular name for the affection more scientifically known as *infantile remittent fever*. Although it is a disease which presents great differences in its course and symptoms, according to the circumstances which have given rise to it, its characteristic symptoms will be found to point (as sir Henry Marsh, the eminent Dublin physician, long ago observed) to the mucous membrane as the original seat of morbid action. The disease seldom occurs during the first year of life; but from the second to the twelfth year, it is an affection often met with. Premonitory symptoms usually occur, and may last for some days. These symptoms are thus described by Dr. Evanson: The child looks ill, and loses his color; he is languid or fretful; complains of pain in the head or belly, is drowsy, but rests badly, starting in his sleep, or grinding his teeth. The appetite fails, the tongue becomes loaded, and the breath offensive. Fever now sets in; or the attack may commence with high febrile symptoms, and be ushered in by a cold fit. When once established the fever is remarkable for the distinctness of the exacerbations, the daily number of which varies in different cases. There is, however, usually one well-marked exacerbation, occurring in the evening and lasting till morning, and followed by a profuse sweat. Three is a common number—namely, one in the morning, one in the afternoon, and a third at night. However cool and lively the child may at other times be it becomes fretful, hot, and heavy, as the exacerbation approaches. During the febrile period all the symptoms become aggravated. As the period of remission approaches these symptoms gradually become less severe, and more or less perspiration appears. As the general disease declines the intermissions become lengthened, while the exacerbations diminish in duration and in intensity. Worms are often present in remittent fever, and give rise to many of the above-named symptoms; but as the symptoms often remain after worms have ceased to be expelled, the latter cannot be regarded as being always the sole cause of this disease.

With regard to the treatment of remittent fever, the first point is to improve the condition of the intestinal canal, and to correct the morbid secretions poured into it. "From the deranged state of the secretions," says Dr. Evanson, "the occasional use of a mercurial is often very beneficial; and it may be given combined with an aperient or a diaphoretic, according to the circumstances. The powder of jalap, simple or compound, is that which we prefer, and the addition of some ipecacuanha increases the effect." He recommends the following formula: Powdered jalap, 30 grains; powdered ipecacuanha, 5 grains; calomel, 5 grains; white sugar, 10 grains. From 2 to 5 grains of this powder may be given every three hours, till the bowels are freely moved. He adds that, to give cold drinks and keep the body cool by light clothing, and the use of an airy apartment (while we enjoin quietness, and occasionally exclude the light), is essential to recovery. When the bowels are not irritable a solution of crystals of tartar (bitartrate of potash) given cold, in the form of *imperial* (see TARTARIC ACID), possesses many advantages, as it acts on the kidneys, while it allays thirst, and tends to keep the bowels open. In the more advanced stages, when debility sets in, we have found the mineral acids useful. They can be employed much sooner than quinine; but the latter may occasionally be prescribed at the close of the complaint. If there are decided signs of intestinal inflammation leeches must be applied to the abdomen; when there is mere intestinal irritability, Dover's powder and the warm bath will give relief. If diarrhea cannot be checked by other means, turpentine, in doses of one or two drops, rubbed up with gum-water, may be tried. In relation to diet, the great point is to avoid giving such food as leaves a bulky, indigestible residue. When convalescence begins change of air often affords remarkable benefit.

WORM-GRASS. See SPIGELIA.

WORMS, an island with an area of about 36 sq.m., belonging to the Russian government of Esthonia, and lying to the e. of Dagö. It is flat and generally well-wooded in the interior, and throws out numerous steep promontories, round which strong currents run, so that, often for months together, it is cut off from all intercourse with the neighboring islands of Oesel, Dagö, Runö, etc., as well as with the mainland; and thus the inhabitants, who are of Swedish origin, have remained unmixed with foreign elements. A stranger is a rare and astonishing phenomenon on this island; and he, in his turn, is not less surprised at the peculiar old Swedish dialect, the architecture, and the manners and customs of this small, poor, but happy insular people. There are churches, schools, and about 2000 inhabitants.

WORMS, an ancient and interesting, but decayed t. of Hesse-Darmstadt, in a highly fruitful district on the left bank of the Rhine, 20 m. n.e. of Heidelberg, and communicating with Mainz and Mannheim by railway. Pop. '95, 28,629. Among its

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WORMS, ENTOZOA, ETC.—1. Louse-worm. 2. Nereide. 3. Heteronereis. 4. Glycera. 5. 11. Peripatus. 12. Angleworm. 13. Snouted-neide. 14. Horse-leech. 15. Albio 21. Bot-worm. 22. Needle-worm. 23. Thread-worm. 24. Entozoid. 25. Mecke Swiss tape-worm. 31, 32. Head and joint of gourd-worm.

amone. 6. Heterocirrhus. 7. Phyllochætopterus. 8. Pierus. 9. Hermella. 10. Serpula.
16. Clapsine. 17. Sagitta. 18. Sipunculus. 19. Encapsulated trichina. 20. Trichina.
. 26. Polycelis. 27. Twin-worm. 28. Serrated tape-worm. 29, 30. Head and joints of

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churches, the chief is the cathedral, a massive building 478 feet long and 114 feet wide, in the Byzantine style, with four towers, founded in the 11th and completed in the 12th century. The gothic south portal with its rich plastic decoration belongs to the 15th century. The church of St. Paul, R.C., contains prehistoric, Roman and Frankish antiquities, and many belong to mediæval times. On a hill near the church called the Liebfrauenkirche, a highly esteemed wine, called *Liebfrauenmilch*, is grown. There is a Luther library. The manufacture of polished leather is important; tobacco is also manufactured, and a trade in the wines and the agricultural produce of the vicinity is carried on. Worms is one of the oldest cities of Germany, and is the scene of the *Nibelungen-Lied* (q.v.). It was occupied by the Romans, destroyed by Attila, and afterward rebuilt by Clovis. It was frequently the residence of Charlemagne and his Carlovingian successors, was the place of convocation of many German diets, and was erected into a free imperial city by the emperor Henry V. The most famous diet held here was that at which Luther defended himself before Charles V. and the princes of the empire (commemorated by an imposing monument to Luther erected at Worms in 1868). The industry and commerce of Worms were great during the middle ages, and its pop., as far back as the time of the Hohenstaufens, averaged 60,000, and even amounted to 30,000 at the close of the thirty years' war, but it was almost wholly destroyed by the French in the destructive war of 1689; and though soon after it was rebuilt on a smaller scale, it has never recovered its former prosperity. The site of the old town is only partially occupied by the present one, the rest being laid out in gardens. Here, in 1743, an offensive and defensive alliance was entered into by Great Britain and Austria with Sardinia. See illus., CATHEDRALS, vol. III.

WORMS, AS A DISEASE OF INFANCY. As we have elsewhere (see ASCARIS, ENTOZOA, TAPEWORM, and VERMIFUGES) treated of the natural history of the worms infesting the human subject, and of the remedies to be employed for their expulsion, we shall mainly confine ourselves in this article to the symptoms which are usually considered to be indicative of the presence of worms in children. These symptoms are, however, in reality, only evidence of irritation of the mucous membrane of the intestinal canal, which may be due to other causes than worms, as, for instance, the presence of indigestible matter, unhealthy secretions, or the existence of a morbid condition of the membrane itself. "Indeed, the latter," says Dr. Evanson, "would seem necessary, in many instances, for the production of any symptoms, although worms were present; as they have been passed by children in perfect health, who experienced no inconvenience on their account. Even the evacuation of worms does not prove that the symptoms present were caused by them, though doubtless they are likely to have been aggravated thereby. The worm *may* have been but an accidental accompaniment—a morbid condition of the mucous membrane being the true source of the symptoms."—*On the Diseases of Children*, 4th ed., p. 345. Although all the symptoms commonly referred to the presence of worms may exist without them, yet there is a group of symptoms which pretty certainly indicate their presence, and which, when occurring together, should, at all events, excite our suspicions. These symptoms are divisible into (1) those dependent directly on the presence of worms in the intestines; and (2) those connected with the sympathetic relations of the digestive organs, and due to some form of reflex nervous action.

(1.) "Worms," says Dr. Evanson, "may be suspected to be present when a child looks pale and grows emaciated, while his belly swells and becomes hard—a gnawing, pungent, or twisting pain being felt in the stomach or about the navel. The appetite is usually precarious, at times voracious; the breath is fetid; and the bowels often deranged, being alternately purged or costive, and much mucus passed in the stools. There is commonly picking of the nose, or irritation (often excessive itching) is felt in the lower part of the bowels; and when a child is old enough, he may complain of a sense of sinking or fainting, which seems to attend particularly on the irritation caused by worms. When symptoms are present, and cannot be accounted for by the existence of disease of the mucous membrane or of the mesenteric glands, we have good reason for believing that worms are their cause."—*Op. cit.*, p. 347.

(2.) Among the most marked sympathetic symptoms are those of the head. The sleep becomes unquiet, and the little patient is liable to start up suddenly from slumber; grinding of the teeth is common; the pupils are often dilated, and there may be headache, and sometimes convulsions—symptoms painfully like those of hydrocephalus (q.v.), but often disappearing on the expulsion of worms. A dry cough, unaccompanied by any signs of disease of the thoracic organs, is regarded as a sympathetic or reflex symptom of worms; and vomiting, hiccough, diarrhea, tenesmus, and bloody stools often accompany their presence. The round-worm (*ascaris lumbricoides*) may be present in the small intestine (its ordinary seat) in large numbers without occasioning any disturbance; but when it does give rise to symptoms, the most prominent are sharp colicky pains about the navel, faintness, great emaciation, and voracious appetite. The thread-worm (*ascaris* or *oxyuris vermicularis*) chiefly occurs in the rectum, where it often exists in large numbers, looking like bits of cut thread. In a recently voided stool they are seen to be in rapid motion; hence they are called *ascarides* (from the Greek *askaridzein*, to jump), and hence also, in all probability, the great distress which they occasion as compared with the quiet round-worms. The characteristic sign of the presence of these thread-worms is the itching and irritation felt in the rectum.

WORMS, or VERMES (COMPARATIVE ANATOMY). Most zoologists regard the worms as constituting a subdivision of the ARTICULATA; but one of our latest and best writers on classification—prof. Huxley—confines the synonymous terms ARTICULATA and ARTHROPODA to the insects, myriapods, arachnidans, and crustaceans; and places the higher worms, or *annelids*, with the above classes, in a primary division, or subkingdom, of ANNULOSA; and the less highly organized worms, *scolecids* (in which he includes the *rotifera* or wheel-animalcules, the *trematoda* or flukes, the *tæniadæ* or tapeworms, the *nematoidea* or thread-worms, the *acanthocephala* and the *gordiacea*), in a subkingdom, to which he applies the term ANNULOIDA. The main reasons of his placing the worms under two great subdivisions are—(1) that the annelids resemble the arthropoda in the arrangement of the nervous system, which constitutes a ganglionated double chain, traversed at one point by the œsophagus; (2) none of the scolecids possess any characters in common with the arthropoda generally, or the annelids, other than those which they have in common with all animals. No scolecid has a definitely segmented body, or bilaterally disposed successive pairs of appendages, nor has it a longitudinal chain of ganglia. These grounds of difference outweigh, in his opinion, the many points of resemblance between the annelids and the scolecids—as (1) the resemblance between the ciliated larvæ in many cases; (2) the resemblance between the forms of the mature bodies of many scolecids with that of one of the most familiar of annelids, which is so close as to have acquired for the scolecids the popular name of "worms;" and (3) the fact that in the annelids we see the representatives of that singular system of vessels which attains a perfect development in the "water-vascular" apparatus of many scolecids. The final settlement of the classification of these animals must be decided by further investigation.

With regard to the general characters of worms, it is well known that they are usually of a very elongated form. In the higher groups the division of the body into a number of segments is very distinct; while in some of the lower forms no segmentation can be detected. The segments, when present, are usually homonomous, or, in other words, are mere repetitions of one another. The soft and contractile body may be cylindrical or slightly compressed, or it may be flat and broad, and usually presents a distinct dorsal and abdominal surface. The lateral region is often provided, in the higher forms, with special appendages, resembling minute stumps, which take part in the respiratory process. Among the cuticular appendages must be mentioned the bristles (*setæ*), hairs, hooks, etc., which are often seen. The nervous system of the highest worms—the annelids—has been already sufficiently described in our notice of prof. Huxley's views. From this condition it appears in the scolecids to become more and more rudimentary, till in the parasitic worms it totally disappears. The mouth is absent in the lower forms, but in the higher lies in the mesial line of the abdominal surface, in close approximation to the chief nervous (pre-oral) ganglion, from which most of the organs of the senses derive their nerves, as the eye, the auditory apparatus, and the organs of touch (especially the lips). Some of the parasitic worms, as the tapeworms, etc., are totally devoid of an intestinal canal; others, as the turbellaria (with few exceptions), and the trematoda, have an intestine, but no anal aperture; while the rest have an intestine provided with both mouth and anus. The latter, when present, lies on the posterior part of the body, and sometimes (as in many turbellaria) on the dorsal surface. Except in the gephyrea or sipunculacea, the intestine, when present, is simple, and devoid of convolutions; but is often, as in the leech, provided with lateral blind sacs. The vascular system in the most highly organized worms consists of a closed system of arteries and veins, presenting modifications in different genera. A large vessel which runs beneath the dorsal integument may be seen under a microscope to contract and propel the blood forward, thus fulfilling the functions of a heart, and being the homologue of the dorsal vasiform heart of insects; while a corresponding venous trunk conveys the blood in an opposite direction, and runs along the under surface of the body. These great trunks are united at each segment by transverse vessels, which carry the blood from the ventral vein to the dorsal artery. In the nematelmia, or parasitic round-worms, the system is much simpler; and in the lowest worms no trace of true blood-vessels is discernible. None but the annelida (q.v.), or highest worms, possess special respiratory organs. These occur in various forms. Thus, in the leech and earthworm, a series of pores on each side of the body lead to as many simple sacculi formed by an inward folding of the integument. In the tubicolous annelids, such as the *serpula* (a common inhabitant in the aquarium), the respiratory organs are in the form of long flattened branchiæ, radiating from the head, and generally disposed in a spiral form. When not filled by the red circulating fluid which the annelids generally possess, they are often beautifully tinted with purple, green, and yellow colors, and form a gorgeous crown. In the *arenicola piscatorum*, popularly known as the sand worm, the respiratory organs are seen lying as lateral tufts in the middle part of the body (14 or 16 in number on each side). In the lower worms, there are no definite respiratory organs, the process being carried on partly by the surface of the skin generally, and partly by the water-canals noticed in the article TAPEWORM. As a general rule the worms are hermaphrodites, only one of the five classes into which they are divided—viz., the *nematelmia*, having the sexes separate. A large number of the lower kinds are parasitical; the others are inhabitants of sea and fresh water, mud, earth, etc.

The worms are arranged by V. Carus into the five following classes: (1.) ***Annulata***,

corresponding to the *annelids* of Owen, and described in the article ANNELIDA. (2.) *Gephyrea*, including the sipunculus and its allies. (The term is derived from the Greek *gephyra*, a bridge, because the animals included in it form a connecting link or *bridge* between the echinoderms and the true articulate animals.) In the article Sipunculus (q.v.), in which, according to the old view, that animal is regarded as an echinoderm, there is a figure of a British species, the *sipunculus Bernhardus*. (3.) *Chætognatha* (signifying *shaggy-jawed*, from the Greek *chaitēeis*, shaggy, and *gnathon*, a jaw), including the single genus *sagitta*, which was formerly erroneously placed among the nucleobranchiated mollusks. As the sagitta is not elsewhere described in this work, we may notice that it is a little fish-like animal with a distinct head, the mouth armed with several pairs of lateral hook-like jaws, with an elongated body furnished with one or two pairs of fin-like organs, and with a broad and usually bilobed caudal fin. The sagitta (so called from its arrow-like appearance) is of small size, swims with great rapidity, and is common in the Mediterranean and in the North sea. (4.)*Nematelmia* (from the Greek *nēma*, a thread, and *helmins*, a worm), which are described in a special article. (5.) *Platyelmia* (from the Greek *platys*, flat, and *helmins*, a worm), or *flat-worms*, which are divisible into the three orders: (1) *Turbellaria*, including the planarias, etc.; (2) *Trematoda*, including the flukes; and (3) *Cestoidea*, including the tapeworms. These orders are described in special articles.

For further information on the subject of this article the reader is referred to the various works and memoirs of Milne-Edwards, Grube, De Quatrefages (especially his *Rambles of a Naturalist*), Schmarda, Blanchard, Leuckart, Williams of Swansea (in the reports of the British association), etc. The British worms were not till quite recently described by any competent naturalist, although the labors of Williams of Swansea and Johnston of Berwick (both too early lost to science), are excellent as far as they go. Dr. Johnston's *Catalogue of the British Non-parasitical Worms in the Collection of the British Museum* (Lond. 1865, p. 366), with 20 plates, must be consulted by all who take an interest in this subject, although much of it is now out of date. The most complete work is the *Monograph of British Annelides*, published under the auspices of the Ray society by Dr. Mackintosh of Murthly, one of the most distinguished of the younger generation of Scottish naturalists.

WORM-SEED is the popular name for santonica, from which santonine (q.v.) is extracted.

WORMWOOD is the popular name for *artemisia absinthium*. It not only acts as an anthelmintic, as its name implies, but it likewise possesses tonic and stimulant properties, which prevent the reproduction of worms after their expulsion. An *infusion of wormwood*, made by pouring a pint of boiling water over an ounce and a half of the dried plant, letting it stand for an hour, and straining, taken in doses of a couple of ounces once or twice a day, is a very good domestic tonic, and may be prescribed with advantage even in cases where worms are not suspected.

WORSAAE, JENS JACOB ASMUSSEN, a distinguished Danish archæologist, was b. in 1821 at Veile, in Jutland, where his father held the post of *justitsraad*, or councilor of justice. Worsaae received the rudiments of his education at the gymnasium of Horsens, from whence he proceeded, in 1833, to Copenhagen, with the intention of studying theology. Having, however, soon exchanged his theological studies for law, and again as speeedily relinquished the latter, he turned his whole attention to the history and archæology of the north, which had from an early age presented special attractions to his mind; and in 1838 he obtained the place of assistant in the Royal museum of northern antiquities at Copenhagen, which was then under the direction of the able Danish archæologist, C. J. Thomson, to whom this most valuable collection owes its origin and its present state of excellence. In 1844 appeared Worsaae's important work, entitled *Runamo og Bravalla Slaget*, in which he, with consummate skill and profound erudition, definitely settled the long-pending doubts as to the authenticity and character of the Bleking rock inscriptions, and satisfactorily showed that the supposed runes were no runes at all, but the mere weatherings of the rock; and consequently that the interpretation given by the great Icelandic scholar, Finn Magnussen (q.v.), had no existence but in the mind of its author. This bold but conclusive solution of a long-pending problem, which, from the days of the great Danish historian, Saxo Grammaticus, had occupied the attention of the most learned men of the north, at once placed Worsaae, in the foremost rank of northern archæologists; and the numerous works and monographs which appeared from his pen in after years fully justified the high promise given by his early labors. During the ten years intervening between this period and his nomination in 1854 to the honorary rank of professor in the university of Copenhagen, Worsaae made repeated visits to the other Scandinavian lands, to Great Britain, Germany, France, and other parts of central Europe, which retained traces of the former presence of the Northmen. The Danish government defrayed the expenses of several of these journeys, the results of which have been the publication of numerous works and papers of interest, among which we may instance his *Minder om de Danske og Nordmænderne i England, Scotland og Irland* (Copenhagen, 1851); or Memorials of the Danes and Norwegians in England, etc., of which an English translation appeared the following yeai; and his treatise *Om en forhistorisk saakaldet tysk Befolkning i Danmark* (Copen

1849); etc. Some of the most important of his works on the archæology of his native country are his *Danmarks Oldtid oplyst ved Oldsager* (Copen. 1843); *Blekingske Mindesmärker fra Hedenold* (1846); *Danevirke* (1848); *Den Danske Erobring af England og Normandiet* (1863); *Om Slesvigs Oldtidsminder* (1865). Worsaae always showed himself a warm patriot, and a strenuous opponent of the spread of German tendencies in the duchies, and his views in this direction were forcibly enounced in his *Jylland's Danskhed*, a treatise published in 1850, and especially directed against Jacob Grimm's exposition of the question of German national law. Worsaae's merits have been fully recognized by his countrymen; and the Danish government constantly showed its sense of the estimation in which he was held, by placing him at the head of all important commissions connected with the archæology of the country, appointing him to important posts in connection with the university and antiquarian museums, and bestowing upon him various other marks of confidence and respect. He d. 1885.

WORSTED. Besides the application of this term, explained under Wool and Woolen Manufactures (q.v.), it is also applied to the thick loose woolen yarn used for knitting stockings, etc., known in trade as fingering-yarn.

WORT. See Beer.

WORTH, a co. in s.w. Georgia, partly bounded on the w. by Flint river, drained by Little river; 750 sq.m.; pop. '90, 10,048, chiefly of American birth, with colored. Co. seat, Isabella.

WORTH, a co. in n. Iowa, having the state line of Minnesota for its n. border, drained by Shell Rock river and Lime creek; 408 sq.m.; pop. '90, 9247. Co. seat, Northwood.

WORTH, a co. in n. Missouri, having the state line of Iowa for its n. boundary, 270 sq.m.; pop. '90, 8,738. Co. seat, Grant City.

WÖRTH, a village of Alsace-Lorraine, situated at the confluence of the Sauer and the Salzbach, about 10 m. s.w. of Weissenburg. Here, on Aug. 6, 1870, the French, under MacMahon, were outflanked and defeated with great loss by the Germans, commanded by the crown prince, who took 4,000 prisoners. Wörth suffered considerably during the battle, hand-to-hand fighting taking place in its streets. Pop. over 1000, mostly Protestants.

WORTH, William Jenkins, 1794–1849, b. Texas, entered the U. S. army as a private in 1812; distinguished himself at Chippewa and Lundy's Lane; was promoted, and from 1820–28 was instructor in tactics and commandant of cadets at West Point. He served with rank of col. in the Seminole war, and at its end was brevetted brig.gen. In the Mexican war he commanded a brigade, and later a division, and took part in the battles of Cerro Gordo, Churubusco, Molino del Rey, Chapultepec, and at the capture of Monterey, Vera Cruz, and the city of Mexico. He was brevetted maj.gen. and presented with swords of honor by congress and by the states of New York and Louisiana. A monument was erected over his remains by the city of New York, on the w. side of Madison square.

WORTHING, a fashionable and rapidly-rising watering-place on the Sussex coast, 10 m. w. of Brighton. Pop. '81, 10,976; '91, 16,606. Its importance began with the century, as, prior to that date, it was merely a small unvisited fishing-village. The climate is much milder than that of Brighton, the town and its immediate neighborhood being encircled on the n. and n.e. by almost an amphitheater of hills, which greatly shelter it from northerly winds, and render it one of the best places for a winter resort on the s. coast. The town has no noxious trades or manufactures, but is essentially a place of resort for pleasure-seekers and invalids. The growing of early fruits under glass is carried on.

WORTHINGTON, George, d. d., b. Mass., 1848; graduated from Hobart coll., N. Y., 1860; and from the Gen. theol. sem., 1863. His diaconate in the Prot. Epis. church was spent at Troy, and his subsequent ministerial work was at Balston Spa, N. Y. and at Detroit. He was consecrated bp. of the Prot. Epis. diocese of Nebraska, 1885.

WOTTON, Sir Henry, 1568–1639; b. England; educated at Winchester and Oxford. After a prolonged tour on the continent he returned to England, and became secretary to the earl of Essex. He went with him to Spain and Ireland, but upon Essex's arrest upon a charge of treason escaped to France. He went to Scotland in 1602, charged by the grand duke of Tuscany to warn James of a plot to take his life. He returned to England after the death of Elizabeth, was knighted, and in 1604 made ambassador to Venice where he remained till recalled in 1610. He resumed the Venetian embassy in 1616, having previously gone on a diplomatic mission to the Netherlands. In 1625 he took deacon's orders, to make him eligible for the provostship of Eton college, which he held till his death. He wrote several works which are forgotten, with the exception of his poems.

WOTTON, William, d.d., 1666–1726; b. England; was educated at Cambridge, and ordained to the English church. Among his works is a *History of Rome* (1701). He is best remembered, however, by his *Reflections upon Ancient and Modern Learning* (1694), which began the famous dispute about the authenticity of the *Epistles of Phalares*, and drew out Swift's *Battle of the Books*.

WOUNDS. All injuries attended with a division of tissue, inflicted by weapons of any description, sharp, blunt, or pointed, are classified as wounds. A wound then may be defined as a division of parts produced by external mechanical force. The solution of continuity may be apparent or concealed. It may be merely a scratch on the skin, or the deep-seated structures may be involved. Again the wound may be strictly subcutaneous, the integrity of the skin being retained.

On this account, wounds are generally, from a clinical point of view, divided into the "open" and the "subcutaneous." Wounds are constantly made by surgeons in the exercise of their professional duties, as in the removal of limbs, tumors, etc., and in the restoration of lost or mutilated parts. In general, wounds are inflicted accidentally, and may occur in a great variety of ways. Wounds may be also recognized as infecting or poisonous, such as those received while making dissections, those inflicted by the stings of insects, bites of rabid animals, snakes, etc., and the wounds which afford entrance to the poison of malignant pustule, glanders, and syphilis.

Bryant defines "open" wounds as injuries caused by external violence, the result either of accident or design, in which there is a solution of continuity in the soft tissues, and in which the deeper parts are exposed to the influence of the air through a more or less gaping orifice. The term "subcutaneous" he applies to such injuries as follow external violence, and in which the deeper tissues, bones or viscera, are broken, ruptured, lacerated, or crushed without any breach in the continuity of the soft parts covering them. In such wounds there is no exposure to the influence of the external air. Under this head are classed wounds inflicted in the operations incident to tenotomy, myotomy, and osteotomy. As a rule, "open" wounds are of a more serious character than the "subcutaneous," though when the viscera and important vessels are implicated, the latter are among the gravest the surgeon has to deal with. "Open" wounds heal by a more complicated process than the "subcutaneous," being exposed to risks from which the latter are free. Incised wounds, caused either by accident or in an operation, result from a sharp-edged instrument. Those inflicted by blunt instruments, where more or less tearing results, are known as lacerated. When bruising occurs in the parts wounded, the term "contused" is used. A "punctured" wound is one caused by the thrust of some sharp-pointed instrument, such as a knife, sword, or bayonet, the tissues being pierced and cut deeply. A "punctured" wound may approach in character that of the "incised" or "contused" form of injury. But, generally speaking, in "punctured" wounds, the soft parts are more or less "contused." A "simple" wound is one which has been made by a clean, sharp-edged instrument in a healthy subject, where there is nothing in the condition of the patient or in the nature of the wound to retard repair. Complicated wounds are those where, from the lodgment of foreign matter, or from hemorrhage which has not been controlled, or from more or less contusion or laceration of tissue, repair is interfered with. Local inflammation, constitutional disturbances, the drinking habit, old age, and general poor health, also complicate wounds. In a clean cut, whether the result of a surgical operation or an accident, there are three things which are chiefly to be observed: the hemorrhage, the pain, and the separation of the tissues, more commonly known as "gaping." Ordinarily the capillary bleeding, which results from a clean cut wound, ceases naturally. This depends upon the character and size of the vessels, the position of the part injured, and the general physical condition of the patient. We recognize a condition known as the "hemorrhagic diathesis," whereupon the most trivial cuts result in an unreasonable amount of bleeding. Aside from these irregularities, a wound in a healthy subject ceases to bleed soon after the completion of the injury. Where a hemorrhage takes place from large vessels, a fatal result is rapidly reached, unless promptly interfered with surgically. The pain varies in its nature and degree according to the portion of the body wounded. The skin of the face is much more sensitive than that of the back, buttocks or thighs. Patients vary as to sensibility. Where the physical powers are in normal health, the ability to resist pain is greater, but we have also to estimate the amount of "will-power" in the patient. Dr. Bryant calls attention to the evil influence of anticipation aggravating the suffering of patients. On the other hand, the excitement of battle or the condition of preoccupation, as when one is at work, numbs, as it were, the sensibility to pain. The gaping of a wound is caused by the retraction of its edges, and varies according to the tissues divided. The skin is the most elastic tissue in the body, and retracts rapidly when wounded. Where the part is in a state of tension, the gaping is more decided. In addition to the immediate gaping of fresh wounds, many wounds, unless prevented, will continue to retract for a long time.

The constitutional effects of a wound are in some subjects followed by a severe shock, which varies from mere fainting to a fatal syncope. Sometimes even the simplest operation may be followed by a fatal shock. The central nervous influence puts a sudden stop upon the action of the heart. The degree of shock which follows upon an operation or injury depends upon the importance of the organ injured, the amount of blood which has been lost, the violence exhibited in the injury of the tissues, and the location of the injury in proximity to great nervous centres. Generally speaking, a patient in good health will sustain a severe wound or operation successfully, while those who are suffering from kidney or visceral disease are more liable to succumb. This

condition of "shock and reaction" will be found more fully described under their respective headings.

The local consequences of an incised wound are to be studied in a deep cut which has passed through skin, subcutaneous fat, and fascia. Gaping continues, until, in a brief interval of time, the subcutaneous fat appears, and the divided edge of the true skin seems to be retracting from it and becoming everted. Within an hour or more, the edges of the wound and the adjacent parts become swollen and sensitive. There is a sensation of heat and pain, which may be described as dull, aching, or burning. The sutures become tighter, the parts are much swollen and œdematous, there is a tension upon the wound and a disposition to separate and gape. Gradually, in the course of a few days, where repair goes on normally, these local manifestations will subside, the skin becoming soft and cool, the pulse and respiration normal. But should these conditions be more persistent, increasing in severity, and spreading beyond the margins of the wound into the surrounding parts, or alter in character for the worse, what has been a physiological reparative process will pass into a pathological or diseased one, and the parts will then be said to be in a state of inflammation. The duration of this feverish reaction or traumatic fever does not seem to bear any fixed relation to the severity of the injury.

The fever may appear within twenty-four hours after the receipt of the injury, or this condition may be in abeyance until the second day, and it may continue for twenty-four, forty-eight, or even seventy-two hours. The beginning of suppuration often coincides with the subsidence of the fever, which, when the prognosis is favorable, seldom lasts beyond this period. When the fever runs into the fifth or sixth day, some complication is certain to be present, and a continuance of it beyond this point prognosticates very unfavorably.

The process of repair in wounds is accomplished either by immediate union, or what is known in surgical language as "union by the first intention;" by primary adhesion, or union by the adhesive inflammation; by granulation, or what is known as the "second intention;" by secondary adhesion, or the third intention—that is, by the union of granulations; and lastly, by scarring under a scab, the so-called subcutaneous cicatrization. Repair is identical in all tissues, soft or hard parts, bone or muscle, integument or tendon. The highly vascular tissues more rapidly accomplish this repair than the tendoness or bony structures. The process of healing is analogous to that of ordinary growth. In both there must be "pabulum" for nourishment, and this we naturally expect to find in the blood. But where, from any reason, the blood supply is deficient, either in quantity or quality, or if its elements have become perverted by constitutional disease, such as malaria, syphilis, or where the blood standard has been lowered and injured, as in the case of drunkards, growth, development, and repair must necessarily be interfered with. "The healing process is physiological, and is just equal to its purposes; when it is excessive it becomes pathological, and is known as inflammation." In this condition the process of repair is checked and subsequently undone. A healing by immediate union takes place when the wounded parts, being placed and maintained in contact, stick together. The capillary circulation is restored, and such perfect union is the result that in some instances neither scar nor cicatrix is to be found.

Where healing takes place by primary adhesion, we find, between the edges of the wound, a vast accumulation of cells. This multiplication of cells is the fact which is now recognized by all. It explains the purpose of the exudation of lymph, how this becomes organized, and how, gradually connecting the cut surfaces, it at length forms between them a firm layer of connective tissue, covered with a thin shining cuticle. According to Virchow Billroth, the cell elements take the leading part in this reparative process; while Cohnheim attributes the chief action of this repair to the capillaries. We must also bear in mind the important influence which the nerves exert on the reparative process, and their influence upon nutrition or secretion.

Granulation, or the "second intention" of Hunter, is that process which takes place in a wound where union by immediate repair is impossible. The edges gape and cannot unite; the surfaces, within a few hours, appear to be covered with a peculiar, gelatinous, grayish-white film known as plastic lymph; the structure is more vascular, and the surface appears more even. The wound is said to be cleaning. Now, if these surfaces are brought and kept together, union may result, this film becoming organized; but if the wound be left open, the film increases and takes part in the formation of granulations.

The epidermis gradually extends to the centre of the sore, and cicatrization proceeds. A cicatrix in the skin in time resembles closely true skin; cicatrix in the bone, true bone, and cicatrix in the tendon becomes tough and hard. "It is corpuscular in its origin and clearly fibrinous in its nature, and through it and by it all repair takes place. The result is a scar of fibro-cellular or connective tissue, with a superficial layer of epidermis. Gradually the development of the scar continues, and the connective tissue becomes organized, and the cuticle thicker and more opaque; perfect union by granulation as resultant.

When healing by secondary adhesion takes place, the granulating surfaces are brought together and adhering to each other, as when two divided surfaces are repaired. Here

the embryo cells and capillaries undergo the same changes, provided, of course, that the granulations are normal. By some authorities, that process which is known as healing by scabbing, or beneath the scab, is supposed to be most normal. The serum of the blood which has been effused on the surface of the wound, by reason of its plastic character, quickly coagulates, forming a protective film, beneath which the repair may steadily proceed. The medium of repair is known as "Hunter's plastic lymph."

This is more particularly observable in animals, when, if a wound is left wide open, the blood and other exudations dry upon the surface, forming an air-tight covering, under which repair goes on until complete, when the scab is cast off. In man such a process is less frequent, because, in the first place, exudations seem to be more often produced under the scab, which detach it and prevent the healing.

Every wound is followed by more or less tendency to an inflammatory process. In healing by granulation a very low degree of inflammation is best; while for healing by secondary adhesion or by scabbing, inflammation must be altogether absent. Everything must be done to avoid inflammation. Generally speaking, however, the inflammation ordinarily present in a wound does not require special attention, except when it exists in the large joints, the peritoneum, lungs, the eye, etc. Here serious mischief may be rapidly induced by inflammation.

In the treatment of wounds we must understand the natural processes, and make use of this knowledge as aids in our surgical art. When we have a "simple incised wound," in which the hemorrhage has been arrested by elevation of the parts, moderate pressure, or the application of a cold or hot sponge, the surgeon is called upon merely to protect the wound from outside infection, suitable cleansing and coaptation of the edges having been attended to. But in more severe wounds there are surgical rules which must be considered. First, as to position: "When comfort has, as far as possible, been secured, the next object should be that the wounded part be relaxed, so that the edges of the wound may come near or together; that no part, and especially no muscle, should be on the stretch, and that the direction of the wound may be such as to allow fluid to flow away from some parts of it. Provision must be made for the protection of the part injured; not only to secure it against the inroad of microbic poison existing in the atmosphere, but also against any internal injury. The cleansing of a wound is the first process after diagnosis has been arrived at. The first rule is summed up in the word "gentleness." Water which has been rendered antiseptic should be brought to bear upon the injured part by using either the irrigating bottle or the tube. Such foreign substances remaining in the wound as may be capable of hindering union by first intention must be removed by the forceps. (See Antiseptics.) The next process is to arrest the bleeding. Even capillary oozing must be stopped. A quantity of blood beyond that which is required in the process of repair acts as a foreign substance, and hinders union by first intention. Dr. Bryant recommends the use of a lotion composed of hot water and iodine to check the oozing of blood and to excite repair. The wound having been cleansed and the bleeding arrested, the coaptation of the divided surfaces must be effected. This is to be accomplished by the use of sutures, by suitable bandaging, and, in some instances, by the application of plaster. The interrupted and continued sutures are more commonly employed. The twisted, quilled, and buttoned sutures are also frequently made use of. The materials used for sutures are silk, catgut, horse-hair, and silver wire. In the interrupted suture, strips of adhesive plaster reinforce the sutures, whether of silk or wire. Another agent in the treatment of wounds is pressure; well-applied pads of lint, medicated absorbent cotton wool, and antiseptic gauze or sponge are carefully adjusted for this purpose. These pads are retained in position by means of strapping, by adhesive plaster, or by splints. Next to position, it is of the utmost importance that the wounded part be placed so as to avoid the least possible motion. Drainage is another important consideration in the treatment of wounds. "Pent-up fluids not only tend to separate tissue which are intended to unite, giving rise to pain by producing tension, but they are prone to excite inflammation, and undergo septic changes which may give rise to blood poisoning, septicæmia, or pyæmia. No general rules can be given regarding the time at which any or the whole of the dressing should be removed. Time varies from two days to even a week longer, according to the nature of the wound, situation, etc. Generally speaking, the union of small wounds may be considered safe at the end of a week, and that of larger ones at the end of ten days or a fortnight.

WOUVERMANS, Philip, a Dutch painter of note, was born in 1619 at Haarlem. From his father, Paul Wouvermans, an historical painter, he inherited a taste for art. He studied first with his father, and afterward with John Wynants. He passed his entire life at Haarlem in the assiduous practice of his art, and died in the year 1668. Though his pictures are now highly valued, he is said to have had little immediate success, and to have lived in poverty, pretty much in the hands of the picture-dealers. His pictures are, for the most part, landscapes of small size, with figures profusely introduced, commonly in energetic action. His battle-pieces, in particular, are greatly admired for their spirit and vigor. He had two brothers, also painters, John and Peter, who executed subjects somewhat similar, and whose works have not unfrequently been attributed to him; but they are plainly inferior to Philip.

WRACK, or **SEA-WRACK**, a name sometimes applied indiscriminately to many of the larger *algæ* of the sea-shores, but also employed to designate the species of the genus *fucus* (see FUCACEÆ), some of the most abundant of which are employed on the British shores for the manufacture of kelp (q.v.), and are also much used as a manure. The genus *fucus* has a leathery, dichotomous, generally flat, linear frond, usually furnished with large air-cells, which are included in the substance of the frond; the spores arranged in tubercles, imbedded in mucus, and collected in *receptacles*, through the pores of which they are finally discharged. *F. vesiculosus*, popularly know as *sea-ware*, *kelp-ware*, and in Scotland as *black tang*, is extremely abundant on all the rocky shores of Britain, growing between high and low water mark, and most plentifully near high-water mark, often struggling for existence on the very upper line, and even found among grass and moss in marshy ground occasionally overflowed by the tide. It is the species chiefly employed in the kelp manufacture, because it is more easily collected than any other. It is of a dark olive-green color, sometimes 2 or 3 ft. in length; the frond flat, entire on the margin, with a central rib; the air-cells spherical, in pairs, sometimes as large as hazel-nuts; the receptacles solitary, terminal, turgid, compressed, mostly elliptical Oxen, sheep, and deer eat it, and seek it on the sea-shore in winter when other food is scarce. In Gothland it is boiled and mixed with a little coarse flour as food for hogs. It has been used medicinally in glandular affections, probably owing its value to the iodine which it contains.—*F. nodosus* is another very common British species, sometimes called KNOBBED WRACK, growing nearer to low-water mark than the last, and therefore not so often and easily accessible, but esteemed the very best species for the manufacture of kelp. It has veinless fronds, branched in a somewhat pinnated manner, with large solitary egg-shaped air-cells in the central line of the frond. It sometimes attains a length of 6 feet.—*F. serratus* is also very common, and is easily distinguished by its serrated fronds, and the want of air-cells. It is sometimes called BLACK WRACK. It is less useful for kelp than the other species. In Norway it is used as food for cattle, generally sprinkled with a little meal. It is preferred to other species for packing crabs and lobsters to be sent to market, as it keeps them moist, while, having less mucus than the other species, it is less apt to ferment and putrefy.

Some of the *fuci*, as *F. vesiculosus* and *F. serratus*, on receiving injury by which any part of the frond is broken, throw out a cluster of young sprouts from the injured part.

WRANGEL, FRIEDRICH HEINRICH ERNST, Count VON: 1784–1877, b. and d. Prussia. He entered the Prussian army, 1796; fought the campaigns against Napoleon, rising to the rank of col.; was made maj.-gen., 1823, and lieut. gen., 1838. He was given command of the allied troops against Denmark, 1848, but shortly afterwards went to Berlin and quelled the revolution there, for which service he was made gen. of cavalry, 1849. He was created a field-marshal, 1856, upon the 60th anniversary of his service. He took part in the war of 1866, but held no command on account of his great age. He was connected with the army for over 80 years.

WRANGELL, FERDINAND, Baron von, 1796–1870; b. Russia; entered the navy; in 1820 led a sledge expedition to the polar regions, co-operating with Anjou, reaching 72° 2′ n. lat., discovering but not reaching the open polar sea, and also failing to reach the large tract discovered and called Wrangell's Land by Long in 1867. From 1829 to 1834 Wrangell was governor of Russian America, and in 1847 was made vice-admiral. Accounts of his expedition have been published in German and English.

WRANGLER, the name given at the university of Cambridge to those who have attained the first class in the public mathematical honor examinations. The word wrangler is derived from the public disputations in which candidates for degrees were in former times required to exhibit their powers. The examination is confined to mathematics, pure and mixed; it is conducted by two moderators and two examiners, with an additional examiner. The honor men who compose the mathematical *tripos* number usually about 100, and are divided into three classes—*wranglers*, *senior optimes*, and *junior optimes*, each candidate being placed in order of merit. The head of the tripos is called the *senior wrangler*. Heretofore this was the final result of the tripos, and this still holds for the first two parts of the examination; but it has been decreed that, from 1882 onwards, the third part of the examination coming six months afterward is to have the effect of sub-dividing the *wranglers* into three classes, the members of each class being arranged alphabetically. The number of wranglers varies from year to year. It has rarely been under 35, and has often been 45 or upward, the number not being limited, otherwise than through the application of a certain high standard of excellence. See **CAMBRIDGE, UNIVERSITY OF.**

WRASSE, or ROCK-FISH, *Labrus*, a genus of fishes of the family *labridæ* (q.v.), of the section having cycloid scales, *cyclolabridæ* of Müller. They have spiny fins, large thin scales, and an uninterrupted lateral line The mouth is protrusible, with thick fleshy lips, folded so as to appear double. The teeth on the jaws are simple, in one or more rows; the lower pharyngeal bones are completely fused together, and have broad grinding teeth. The form is somewhat perch-like, with the back more straight. There is a single long dorsal fin, the spines of the anterior portion of which are surmounted by short membranous filaments, the posterior portion having short and split rays. The

ventral fins are under the pectorals. The colors are generally very brilliant. The species are numerous, abounding in tropical seas, but several of them are found on the coasts of Britain. They chiefly frequent rocky shores, and are generally seen in small shoals, often hiding under sea-weeds. They feed on crustaceans, mollusks, and marine worms. They are often caught by bait intended for other fish, but their flesh is not much esteemed. The BALLAN WRASSE (*L. bergylta*, or *maculatus*) is one of the most common British species. It attains a length of about 18 in., and a weight of more than 3 pounds. It is bluish-green, paler on the belly, all the scales margined more or less broadly with orange-red, the blue prevailing in some specimens, and the orange in others. The COOK WRASSE (*L. mixtus*, or *variegatus*) is not unfrequent on the southern shores of England. Its prevailing color is orange, striped transversely with blue, particularly in the male, the colors of the sexes differing so much that the female has often been described as a distinct species, and is generally known as the RED WRASSE. There are several other British species of this and closely allied genera, as the CORKWING (*crenilabrus melops*, or *tinea*), about 6 in. long, and of a greenish-blue color, varied with yellow. The colors quickly fade after the fish is taken out of the water.

WRAXALL, Sir FREDERICK CHARLES LASCELLES, 1828–65; b. Boulogne; educated at Oxford. He served as assistant commissary in the Crimean war, and published *Camp Life* (1860). Others of his books are: *Handbook to the Armies of Europe; Armies of the Great Powers; Military Sketches; Memoirs of Queen Hortense;* and several novels. Sir Frederick was grandson of Sir NATHANIEL WILLIAM, 1751–1831, a traveler and author who wrote several books of a historical and biographical character, such as *Historical Memoirs of my own Time* (1836).

WREATH, WREATHED, in heraldry. A wreath is a twisted garland of silk of different colors, otherwise called a torce, on which it has, since the 14th c., been usual to place the crest. The side-view of a wreath thus dawn exhibits six divisions, which are generally tinctured with the livery colors—that is, the principal metal and color of the shield. Every crest is now understood to be placed upon a wreath, except when it is expressly stated to issue out of a chapeau or coronet. A wreath, when represented alone, shows its circular form. A Moor's head is sometimes encircled with a heraldic wreath. A wreath is always understood to be the twisted garland of silk above explained, unless otherwise specified; but wreaths of laurel, oak, ivy, etc., sometimes occur, and savages used as supporters are often wreathed about the head and middle with laurel. Ordinaries are occasionally *wreathed*, otherwise called *tortillé*, in which case they are represented as if composed of two colors, twisted as in the heraldic wreath; as in the coat of Carmichael, argent, a fess wreathed azure and gules.

WRECK, in maritime law, all goods cast upon land by the sea, and so left as to belong not to the jurisdiction of admiralty, but of the common law. By an ancient English statute, long since repealed, if any, either man or animal, escaped alive, there was, legally speaking, no wreck. Wreck belonged to the crown, but the rule is now, both in England and the United States, that it may be claimed by the owner within a year and a day, and afterward may be sold and the proceeds held by the government. For the compensation paid sailors, see SALVAGE.

WREDE, KARL PHILIPP, Prince of, a Bavarian field-marshal, was born at Heidelberg, April 29, 1767. Belonging to a noble family, he early obtained official employment, and in 1792 was assessor to the high court of Heidelberg; in 1793, was elected "civil commissary" in the palatinate, and in this latter capacity accompanied for five years the armies of Wurmser, duke Albert, and the archduke Charles, in Italy and Germany; and frequently took a direct share in military operations. In 1799 his military career may be said to have commenced by his leading a body of Bavarian volunteers to join the archduke Charles, and for his distinguished conduct in that campaign he obtained, May 15, 1800, the grade of maj.gen. After the peace of 1800, he devoted much time and labor to the organization of the Bavarian army; and, when war was renewed, found himself at the head of the Bavarian contingent, well disciplined and thoroughly equipped, fighting side by side with his former foes the French, and took a prominent part in most of the campaigns against the Austrians, Prussians, and Russians till 1813. But after the retreat from Russia, offended at some real or fancied insults which had been offered to him, he returned to Munich, joined the anti-French party, which was headed by the queen and crown-prince; and, though his intrigues were put a stop to by the victories of Lützen and Bautzen, he soon after succeeded in bringing about the treaty of Oct. 8, 1813, by which Bavaria joined the coalition against France, and, before the end of the same month, was at the head of 70,000 men. Attacked by Napoleon with an inferior force, he was, after a bloody and protracted contest, defeated at Hanau. He was chosen soon after to command the fourth corps of Schwarzenberg's army, and though unsuccessful in most of his petty conflicts, contributed considerably to the successful advance on Paris. His services were rewarded by the dignities of field-marshal (March 7) and prince (June 9, 1814), and by the gift of the domain of Ellingen. On the brief renewal of the contest during the "hundred days," Wrede was preparing to invade Lorraine, when the battle of Waterloo put an end to the strife. After this period, Wrede was employed on many important missions,

and was charged with the pacification of Rhenish Bavaria during the revolution of 1830. He died at Ellingen, Dec. 12, 1838.

WREN, Sir CHRISTOPHER, a renowned English architect, was born at East Knoyle, in Wiltshire, on Oct. 20, 1632. His father, Dr. C. Wren, was dean of Windsor, and his uncle, Dr. M. Wren, was bishop successively of Hereford, Norwich, and Ely. At an early age, young Wren was placed at Westminster school, under the celebrated Dr. Busby, and while yet only in his fourteenth year, was entered a gentleman-commoner of Wadham college, Oxford. Here he made considerable progress in mathematical studies, and attracted the notice of the cultivators of physical science—whether resident at the university or visitors—by his inventions of certain mathematical instruments, and his general zeal, and enthusiasm in the pursuit of experimental philosophy. In 1650 he took his degree of B.A., and in 1653, that of M.A., having been previously made fellow of All Souls. He now also became a member of a society established at Oxford for the improvement of natural and experimental philosophy; and in 1654 is spoken of by Evelyn, in his *Diary*, as "that miracle of a youth;" also, in his *Sculptura*, as "that rare and early prodigy of universal science." The acquaintance thus begun, ripened into a firm friendship between Wren and Evelyn.

In 1655 Wren greatly assisted in perfecting the barometer, then only recently invented. In 1657 he left Oxford for London, where he became Gresham professor of astronomy. In May, 1661, however, he returned to Oxford, as Savilian professor of astronomy. The same year he received the degree of D.C.L. Before leaving London, Wren had in conjunction with lord Brouncker, the Hon. Robert Boyle, Mr. Bruce, Dr. Wilkins, sir Robert Moray, and others, who used to meet together at Gresham college, laid the foundation of the future Royal Society. Before the society was formally incorporated, the members felt much the absence of Wren from their meetings, and one of their first proceedings was to get the king to lay his commands upon him to perfect a design he had in hand of a globe of the moon, and to "proceed in drawing the shapes of little animals as they appear in the microscope." The lunar globe was finished, much to the satisfaction of his majesty, who placed it in his cabinet of rarities. He also summoned Wren from Oxford to assist sir John Denham with his advice on architectural subjects; the poet Denham having been appointed surveyor-general of his majesty's buildings, but possessing little or no knowledge of the subject.

The study of architecture was one to which Wren had given great attention, while still a very young man, notwithstanding his devotion to mathematics, astronomy, chemistry, and even anatomy. In 1663, in his capacity of assistant surveyor-general, he was offered a large salary to go to Tangier, to survey and direct the works at the mole, harbor, and fortifications; but this commission he declined. In the same year Wren was engaged by the dean and chapter of St. Paul's to make a survey of the cathedral, with a view to certain projected repairs in that vast fabric. He accordingly drew up a very careful and elaborate account of the state of the building, with suggestions for its improvement and accompanying drawings and designs. All of these were laid before the king; but before any further steps were taken for the restoration of St. Paul's, that building was leveled to the ground by the memorable fire of 1666, and Wren was destined to be the architect of the new cathedral, instead of the restorer of the old. The first work actually built from a design by Wren was the chapel at Pembroke college, Cambridge, in 1663. But in the same year he designed the Sheldonian theater at Oxford, which was commenced in 1664, and finished in 1669. In 1664 Wren also designed some valuable additions to the buildings at Trinity college, Cambridge; particularly the beautiful western quadrangle known as Nevile's court. To this he added, in 1666, the library of Trinity college, said by Gwilt to be "one of his finest productions, and one with which he himself was well satisfied. It consists of two orders; a Doric arcade below, open to a basement supported by columns, which has a flat ceiling. . . . The principal story is decorated with three quarter columns of the Ionic order, well proportioned."

In 1665 Wren visited Paris, where he made the acquaintance of Bernini, architect of the Louvre, and of other distinguished men. In the following year he returned to find the royal society earnestly engaged in searching out the causes of the great plague, so soon to be succeeded by the great fire which laid London in ashes. This disaster at once opened a wide field for the exertion of Wren's genius. He formed a plan, and drew designs for the entire rebuilding of the metropolis, embracing wide streets, magnificent quays along the banks of the river, and other well-considered improvements. In rebuilding London, however, few of Wren's recommendations were adopted. He was certainly chosen to be the architect of new St. Paul's, one of the finest non-Gothic cathedrals in the world; besides which, he designed more than 50 other churches in place of those destroyed by the fire. The great church of St. Paul, built on the model of St. Peter's at Rome, was begun in 1675, and completed in 1710, when the last stone was laid upon the lantern by the architect's son, Christopher. Besides the numerous churches mentioned, Wren built the royal exchange, London, in 1667; custom-house, London, in 1668; Temple Bar in 1670; the monument, in 1671–77; the college of physicians in 1674–98; the royal observatory, Greenwich, in 1675; the gateway tower, Christ church, Oxford, in 1681–82; Chelsea hospital, 1682–90; Ashmolean museum,

Oxford, 1683; Hampton court, 1690; Morden college, Blackheath, 1692; Greenwich hospital, 1696; Buckingham house, 1703; Marlborough house, 1709; the towers at the w. front of Westminster abbey in 1713; besides the unfinished palace of Winchester, in 1683.

In 1672 Wren received the honor of knighthood. In 1674 he married Faith, daughter of sir John Coghill, by whom he had a son, Christopher, who survived him; and his wife dying, he married, in 1679, Jane, daughter of viscount Fitzwilliam, by whom he had issue, a son and daughter. In 1680, Wren was elected president of the royal society. In 1684 he was made controller of the works at Windsor castle; and in 1685 he was elected grand master of the order of freemasons. He was also elected a member of the house of commons for New Windsor in 1689, and being unseated on petition, was immediately re-elected for the same place. In 1698 he was appointed surveyor-general of the works and repairs at the abbey of St. Peter, Westminster; and in the same year, was again elected grand master of the freemasons. Wren died in his chair after dinner, Feb. 25, 1723, aged 90 years, and was buried in St. Paul's cathedral, where the appropriate inscription of "*Si monumentum requiris, circumspice,*" marks his tomb. During his declining years, he was treated with neglect, and even injustice, by the court of England; "one Benson" was appointed by George I. to supersede him in the office of surveyor-general; and some private individuals carped at his works in a most malevolent spirit. Steele, however, vindicated the fame of his friend in the *Tatler*, in which Wren is introduced in the character of Nestor; and few have been found since that time hardy enough to call in question the well-merited reputation of sir Christopher Wren as a distinguished architect, mathematician, and scientific observer.

WREN, *Troglodytes*, a genus of birds of the creeper family *certhiadæ*, having a slender, slightly curved, and pointed bill, the edge of the mandibles entire; the wings very short and rounded; the tail short, and carried erect; the legs slender, and rather long. Their plumage is generally dull. They are natives chiefly of the northern hemisphere, and most of them are American. They live on or near the ground, seeking for insects and worms among low bushes, and in other similar situations. The COMMON or EUROPEAN WREN (*T. vulgaris*) is found in all parts of Europe, and in the n. of Asia. It is more abundant in the northern than in the central and southern parts of Europe, and is found even in the Arctic regions. It is a very small bird, only about 4 in. long, reddish-brown above, with narrow transverse streaks of dark brown, yellowish-white below, the greater wing-coverts with three or four small bead-like spots of white. From its peculiarity of form, and its active, lively habits, it is one of the most familiarly known of British birds. It frequents gardens, hedges, and thickets. Its flight is not long sustained; it merely flits from bush to bush, or from one stone to another, with very rapid motion of the wings. It sometimes ascends trees, nearly in the manner of creepers. The male has a loud sweet song. The nest is large for the size of the bird, oval, domed above, with an opening on the side, and is composed of hay or moss, lined with feathers, and generally of materials such that it resembles in color the objects beside it, and is not easily discovered. It is often placed under the thatch of a building, under the turf of a turf-topped wall, against the side of a moss-covered tree, or under an impending bank, always so as to be sheltered from rain. The eggs are usually from 7 to 10 in number, and the male is assiduous in his attentions to the female in supplying her with food during incubation, and afterward assists her in the care of the young. Two broods are produced in the season. In severe winter weather, a number of wrens often take shelter together in an old nest or in a hole of a wall; sometimes they roost in byres, to enjoy the warmth proceeding from the cattle. When driven from bushes, the wren is easily run down; and the hunting of wrens on St. Stephen's day is an old custom in the s. of Ireland. In general, however, the wren is almost as much a popular favorite in Britain as the redbreast. The name *Kitty Wren* is popularly given to it in many parts of the country.—The North American species of wren are numerous; some of them, however, have recently been placed in new genera.—The HOUSE WREN (*T. ædon*) is larger than the European wren, being about 5 in. long. It is reddish-brown above, barred with dusky, and pale fulvous white below, with a light brownish tinge across the breast. It is abundant in the eastern parts of the United States. It is less shy than the European wren, and often builds its nest near houses, and in boxes prepared for it. The nests are made to fill the boxes; and to effect this, a large mass of heterogeneous materials is sometimes collected. The song of the house wren is very sweet. The male is a very bold, pugnacious bird, readily attacking birds far larger than itself, as the blue-bird and swallows, and taking possession of the boxes which they have appropriated for their nests. It even attacks cats when they approach its nest.—The WINTER WREN (*T. hyemalis*), is so similar to the European wren, that it is not easy to state a specific difference. It is common throughout North America, from Labrador to Louisiana, and partially migratory. Several other species are common in North America, as the CAROLINA WREN (*Troglodytes* or *thryophorus ludovicanus*) and the MARSH WREN (*Troglodytes* or *cistophorus palustris*), both of which are found chiefly in the vicinity of water. All of them agree very nearly in their habits with the common wren. See illus., BIRDS, fig. 1; LARKS, ETC., fig. 25.

WREX'HAM, a municipal and parliamentary borough in Denbighshire, and one of the most important towns in North Wales, 12 m. s.w. of Chester, on an affluent of the Dee. The town is handsome and lively, and the church, a handsome edifice in perpendicular, was built about the year 1470, though its tower, 135 ft. in height, was not completed till 1500. In the vicinity are several collieries, which, together with lead-mines, iron-works, paper-mills, and breweries, give employment to the inhabitants. It is also of very considerable importance on account of its markets and fairs. Pop. '81, 10,928; '91, 12,552.

WRIGHT, a co. in central Iowa; 576 sq. m.; pop. '90, 12,057, chiefly of American birth. Co. seat, Clarion.

WRIGHT, a co. in central Minn., bounded on the n.e. by the Mississippi river, and on the s.e. by the Crow river; about 684 sq. m.; pop. '90, 24,164, chiefly of American birth. Co. seat, Buffalo.

WRIGHT, a co. in s. Mo.; about 700 sq. m.; pop. '90, 14,484, chiefly of American birth. Copper and lead are found. Co. seat, Hartville.

WRIGHT, CARROLL DAVIDSON, economist and statistician, b. in New Hampshire, 1840, began to study law in 1860 but his course was interrupted by the war in which he served first as a private and finally as a colonel. Resuming his studies in Boston in 1865, he was soon admitted to the New Hampshire bar. After serving two terms in the Massachusetts senate, to which he was elected in 1871, he was chief of the bureau of labor statistics of Massachusetts from 1873 to 1888, and in the meanwhile superintended the state censuses of 1875 and 1885. In 1885 he was appointed U. S. commissioner of labor and, while in this office, has superintended the publication of a large number of very valuable documents relating to all phases of the labor question. In 1895 he was appointed to the chair of political science in the Catholic University of America, at Washington. Besides the official publications of the department of labor, including the reports and the bulletins, he has written, *The Industrial Evolution of the United States* (1895).

WRIGHT, ELIZUR, b. Conn., 1804; graduated at Yale in 1826. He was professor of mathematics and natural philosophy at Western Reserve college, 1829–33, when he settled in New York, where he was for 5 years secretary of the anti-slavery society, editing within that time 2 anti-slavery periodicals, *Human Rights* and the *Quarterly Anti-Slavery Magazine*. He went to Boston, 1839, and edited the *Massachusetts Abolitionist*, the *Chronotype*, and its successor, the *Commonwealth*. He was state insurance commissioner of Massachusetts, 1858–66. He took a very active part in the discussions on life insurance. He published a translation of La Fontaine's *Fables* in 1841. He was a prominent member of the liberal league. He d. 1885.

WRIGHT, FANNY. See D'ARUSMONT, FRANCES.

WRIGHT, HORATIO GOVERNEUR, b. Conn., 1820; graduated at West Point, and was appointed to the engineers. He was assistant professor of engineering at West Point, 1842–44, and was commissioned maj. in 1861. At the first battle of Bull Run he was Heintzelman's chief engineer; commanded the 2d brigade in the expedition to Port Royal, and was head of the expedition to which Fernandina, Fla., surrendered in 1862. The next year he led a division of the army of the Potomac at Gettysburg. He commanded the 6th corps during the Richmond campaign; went through the Shenandoah campaign, and was wounded at Spottsylvania and Cedar creek. He served through the war, attaining the rank of maj.-gen.; chief U. S. corps engineers, 1879; retired, 1884.

WRIGHT, JOSEPH, 1756–93; b. N. J. In 1772 he went to England; studied art there and had some success as a portrait painter. Among his sitters was the prince of Wales. After his return to this country he painted three portraits of Washington, was the designer of the first national coins, and the first draughtsman of the U. S. mint.

WRIGHT, SILAS, 1795–1847; b. Mass.; educated at Middlebury college, and called to the bar. He began practice in Canton, N. Y., in 1819. The next year he was elected surrogate, and in 1823 he became a democratic member of the state senate, where he opposed the policy of DeWitt Clinton. He sat in congress, 1827–29, and approved the protective tariff of 1828, though at a later period he favored a tariff for revenue only. A motion to appoint a committee to investigate the expediency of abolishing slavery in the District of Columbia received his vote. He was comptroller of New York, 1829–33, when he was elected to the U. S. senate, where he remained till 1844, when he was elected governor of New York. During his service in the senate he supported Henry Clay's compromise bill, and Jackson's removal of the deposits from the U. S. bank, the re-charter of which he opposed. He voted against Calhoun's motion not to receive a petition for the abolition of slavery in the District of Columbia, and against the Rives resolution in 1838, denying the right of the states to meddle with slavery in the territories. He favored the annexation of Texas, and voted for the tariff of 1842. He declined several offices from Tyler, and the secretaryship of the treasury from Polk. He failed of a re-election as governor in 1846.

WRIGHT, THOMAS, an English antiquary and historian, was b. near Ludlow, in 1810, and was educated in the grammar-school of that town. From school he proceeded to Trinity college, Cambridge, where he took his degree of B.A. in 1834, and subse-

quently that of M.A. At an early age Wright showed considerable literary talent, and while still at the university, contributed to *Fraser's Magazine*, the *Gentleman's Magazine*, the *Literary Gazette*, and other periodicals. In 1835 he came to London, and at once commenced the career of a man of letters; and from that time till his death he was continually before the public in the capacity of author, editor, or translator. In 1837 he was elected a fellow of the society of antiquaries; and in the following year published his first considerable work, entitled *Queen Elizabeth and her Times* (2 vols. 8vo). In this year also he was one of the two founders of the Camden society, for which he edited various works at different times, such as the *Latin Poems of Walter Mapes*, *Letters on the Dissolution of the Monasteries*, etc. He was also for some years honorary secretary of the Camden society. In 1843 Wright, in conjunction with his friend, Mr. Roach Smith, founded the British archæological association. He also took an active part in the formation of the Percy and Shakespeare societies, and for each of these, from time to time, edited volumes. Upon the death of the earl of Munster, in 1842, Wright was elected to succeed him as corresponding member of the institute of France, an honor never before attained by one so young. There were several candidates; but Wright was chosen by a large majority, among whom were two ministers of state, MM. Guizot and Villemain. Wright was also a member of the society of antiquaries of France, of the ethnological society of Paris, of the Royal society of northern antiquaries of Copenhagen, and of other learned societies on the continent and in America.

Of Wright's various works—said to exceed 100 volumes in number, including, of course, translations and works edited for societies—the following may be regarded as the principal: *Biographia Britannica Literaria*, 2 vols., of which the Anglo-Saxon period appeared in 1842, and the Anglo-Norman in 1846; *Essays on Subjects connected with the Literature, Popular Superstitions, and History of England in the Middle Ages* (2 vols. 1846); *The Archæological Album, or Museum of National Antiquities, the Illustrations by F. W. Fairholt* (1845); *England under the House of Hanover, Illustrated from the Caricatures of the Day* (2 vols., 1848); *Narratives of Sorcery and Magic* (2 vols. 1851); *History of Ludlow* (1852); *The Celt, the Roman, and the Saxon: a History of the Early Inhabitants of Britain down to the Conversion of the Anglo-Saxons to Christianity* (1852; 2d ed. 1861); *History of Ireland* (3 vols. 1854); *Wanderings of an Antiquary* (1854); *Cambridge University Transactions* (2 vols. 1854); *Dictionary of Obsolete and Provincial English* (2 vols 1857); *History of France* (3 vols. 1856–1862); *Guide to the Ruins of the Roman City of Uriconium, at Wroxeter, near Shrewsbury* (1859); *Political Poems and Songs relating to English History, composed during the Period from the Accession of Edward III. to that of Richard III.* (2 vols. 1859–61). These volumes form part of the series of works published, under the direction of the master of the rolls, in illustration of the mediæval history of England; *Les Cent Nouvelles Nouvelles* (2 vols. 1858), being a collection of mediæval tales from the only known manuscript of the same, discovered by Wright in the library of the Hunterian museum, Glasgow; *Essays on Archæological Subjects* (2 vols. 1861); *History of Domestic Manners and Sentiments in England during the Middle Ages, with Illustrations by F. W. Fairholt* (1861); *A History of Caricature and Grotesque in Literature and Art, with Illustrations by F. W. Fairholt* (1865). To these may be added his *Womankind in Western Europe* (1869); *Uriconium: a Historical Account of the Ancient Roman City* (1872); and his translations of Pauli's *King Alfred*, and of Napoleon's *Julius Cæsar*. He died Dec. 23, 1877.

WRIGHT, William, ph.d., ll.d., b. Bengal, India, 1830; educated at St. Andrew's and Halle universities; became deeply learned in the oriental languages, and was made professor of Arabic in University college, London, 1855; in Trinity college, Dublin, 1856; and in Cambridge, 1870. From 1860 to 1870 he was employed as assistant in the manuscript department of the British Museum. He received the degree of ll.d. from Cambridge, Dublin, Edinburgh, and St. Andrew's, and ph.d. from Leyden. He published several translations from the Arabic and Syriac; among others the *Apocryaphal Acts of the Apostles*, and the *Book of Jonas in four Oriental Versions;* also a grammar and text-books of the Arabic. He died in 1889.

WRIGHT, William Aldis, b. England, 1836; educated at Cambridge and became librarian of Trinity college. He contributed many articles to Smith's *Dictionary of the Bible*, and has edited Bacon's *Essays*, *The Bible Word-Book*, Chaucer's *Clerke's Tale*, and Robert of Gloucester's *Metrical Chronical*. He was also co-editor with W. G. Clark of the Cambridge and Globe editions of Shakespeare. He was vice master of Trinity college (1888).

WRIGHT'IA, a genus of plants of the natural order *apocynaceæ*, containing some of the greatest twining shrubs of the East Indies, such as, attaching themselves in the first instance to trees for support, become themselves at last of tree-like thickness, as well as height, and kill the supporting trees by their choking embrace. The corolla is salver-shaped, with scales in its throat; the fruit consists of two erect follicles. The leaves are simple, generally ovate, or nearly so. The timber of some species, as *W. mollissima* and *W. coccinea*, is valuable. *W. antidysenterica*, a native of Ceylon, yields Conessi Bark, a valuable astringent and febrifuge; *W. tinctoria*, common in many parts of India, yields excellent indigo, and was strongly recommended for cultivation on this account by Dr. Roxburgh, the produce being large, and the plant less dependent on rain than the species of *indigofera*.

WRIT is a general term much used in the law to denote a formal document proceeding in the queen's name, or the name of a judge or other officer of the law. Such is a writ of summons commencing an action at law. In nearly all actions and proceedings, writs of various kinds are issued, which are named from the nature of the particular act to be done.

A writ is issued by a court or some other competent authority, sealed and signed by the clerk of the court or other proper officer, and directed to the sheriff or other person authorized to execute it. It may issue at the beginning of or during an action. Writs are *original*, beginning proceedings; or of *mesne process*, during proceedings; or of *execution*, making operative the judgment of the court. Many of the old common-law writs have been abolished. Most important are the writs of *habeas corpus*, of *certiorari*, and of *error*.

WRITER, a term vaguely applied in Scotland to a law practitioner or his clerk; in provincial towns more definitely to a law agent practicing before the sheriff, and acting as factor in the management of private affairs.

WRITER TO THE SIGNET, or CLERK TO THE SIGNET, the name of an important body of legal practitioners in Edinburgh, who derive this designation from having been originally clerks in the office of the secretary of state, where the different writs that passed under the king's signet were prepared. Act 1537, c. 39, establishing the college of justice, mentions the clerks to the signet as a previously existing body; and though no charter of incorporation is extant, the society is considered entitled to all the privileges of a corporation. The keeper of the signet, an officer appointed by the crown, appoints one of the members of the society of writers to the signet his deputy, who is in use to preside at meetings of the society, and along with certain other members named by him as commissioners to manage its affairs. Admission to the society must be preceded (1) by attendance during two different sessions, or two full winter courses of lectures on the faculty of arts of a Scottish university; (2) by a five years' apprenticeship; (3) by attendance on four courses of law in the university. Previous to admission the candidate is examined in scholarship and in law. The whole expense of admission to the society, including the apprentice fee of £200, is £410, 15s. 6d. The writers to the signet have long been the principal body of law agents practicing before the supreme courts of Scotland; and the individual members of the body are also entitled to practice before the sheriff court in all matters which have been transferred by statute from the supreme courts to the sheriff court, as proceedings in bankruptcy. They possess the exclusive right of preparing the warrants of charters of land flowing from the crown, of signing summonses citing parties to appear in the court of session, and all other writs that pass the signet, as diligences for affecting the person or estate of the debtor. A very considerable proportion of the conveyancing business of Scotland is in their hands, and they are largely employed as factors in the management of private affairs. Most of them are notaries public. They possess a large and valuable library.

Act 36 and 37 Vict. c. 63 has transferred to a newly-created body, called "law agents," the exclusive right of practicing before both the supreme and the inferior courts of Scotland. Admittance to this body must be preceded by a five years' apprenticeship, which if entered on after 1873 must be under an indenture duly recorded and intimated to an officer, called the registrar of law agents, within six months from its commencement. A three years' apprenticeship is to be held sufficient in the cases of a person who has been five years clerk to a law agent, is a graduate in law or arts, an advocate in Scotland or barrister in England, or an enrolled attorney or solicitor in England. The applicant is admitted by the court of session after an examination by examiners appointed by the court. Persons who prior to Feb., 1874, were members of the society of writers to the signet, or of the society of solicitors before the supreme courts, or procurators before the inferior courts, are entitled on application to be enrolled as law agents. For three years, from Aug., 1873, the qualifications for admission are relaxed in favor of persons in course of qualifying as procurators, under the procurators act, 1865. Before being allowed to practice before the court of session or any inferior court, a law agent must subscribe the roll of that court. Any law agent may on application to the court of session be admitted a notary public.

WRITERS' CRAMP, or SCRIVENERS' PALSY, is a peculiar kind of local spasm, in which every attempt to write instantly calls forth uncontrollable movements in the thumb, the index and middle finger, so that the pen starts up and down on the paper, and instead of a legible handwriting a mere scrawl results. "The more," says Romberg, "the patient persists in his attempt, the more the difficulty of using his pen increases; and to the visible and sensible contractions of the muscles of the thumb, contractions of the fore-arm, and even of the upper-arm, are often superadded. Abnormal sensations, especially of a sense of weight and constriction of the hand or of pain extending from the upper arm to the back, are occasionally present. It is diagnostic of these attacks that they are instantly arrested when the individual ceases writing, and that the hand is capable of every other combination of movements and exertions."—*The Nervous Diseases of Man*, vol. i. p. 320. The disease is chiefly confined to middle age, and scarcely ever occurs in women; and there can be no doubt that an occupation entailing much writing predisposes to it, the quality of the paper or of the pen having nothing to do with

it. The treatment hitherto pursued, both local and general, has, according to Romberg, been "invariably ineffectual." This is, however, too strong a term, since he mentions a case in which Stromeyer applied the principle of division of the muscles to the cure of writers' cramp, and in one case a brilliant result justified the antispasmodic reputation of tenotomy; the patient being perfectly able to write as early as the fourteenth day after the subcutaneous division of the tendon of the long flexor of the thumb." The same operation was, however, several times performed by Diffenbach without success. In some cases, judicious treatment, combined with entire cessation of writing for a considerable time, has led to satisfactory results. Galvanism and the use of strychnia, iron, or conium, have also proved useful.

WRITING is the art of fixing thoughts in a palpable and lasting shape, so as to make them known to others. There are two principles employed in this process, either separately or jointly—viz., ideographism and phonetism. An ideograph is either a picture of the object the idea of which is to be conveyed, or, at a later stage, some symbol which stands, by common consent, for the object, in which case it is called symbolism. Phonetism, on the other hand, is either syllabism—i.e., a combination of consonants and vowels which form a word, or component parts of it—or alphabetism, a system that further breaks up the syllables into their single component parts of vowels and consonants. All systems of writing seem to have originated in ideographism, and to have gradually arrived at phonetism. The pictorial mode of ideography gradually led, as indicated, to the symbolical mode. The former, also called kyriological (Gr. *kyrios*, principal, proper, the opposite of metaphorical or symbolical) writing, contents itself with representing only bodily things, either by fully or partly depicting them, or by merely indicating them by some special characteristic. The latter—the symbolical mode—represents abstract things in accordance with their similarity to corporeal subjects, as in the hieroglyphs of later Egyptian times. Examples of the real delineations of the subjects, or parts of them, which have been replaced by conventional signs, we find at an early period in Egypt, as well as with the Aztecs, with the primitive Assyrians, in ancient China, and in Guiana. Phonetism here no longer aims at a delineation of subjects or symbols, but of the sounds by which these objects are conveyed to the mind. The first step in phonetic writing is, as we said, the syllabic, which by degrees becomes alphabetical. Difficult though it be in many instances to fix accurately the original ideographic meaning of many of the letters now in use, there is yet absolutely no doubt as to their having once been mere pictures of certain things to which a meaning was attached, the sound of which was in some shape connected with the present value of the letter. Our knowledge of Phenician, whence our alphabet is directly derived, and of its cognate dialects, enables us, in many instances, to trace them back to their primitive source. Thus, our *A* was originally depicted as the head of an *ox*, a likeness to which may still be traced in its Phenician form, and its name (aleph = ox) has still survived in Hebrew and Greek (aleph or alpha). This process of the gradual change of a picture into a character is most clearly traceable in the various stages of Egyptian hieroglyphics, which, when written more cursively, assumed such different shapes (in hieratic and demotic respectively), that often there remains scarcely a likeness between different forms of the same characters. Among the ideographic methods there are some, however, which scarcely seem to deserve the name of writing, in the ordinary sense. Such are the Peruvian quippos, or knots, which, by changes in color, size, arrangement, and the rest, indicate a certain special sequence of ideas; further, the "khernus," or sticks, which, before the introduction of their present alphabet, the Tartars used to circulate among their tribes, to indicate the number of men and horses to be used for some special expedition. Similar to the Peruvian quippos was (according to the celebrated Chinese work, *I-king*) also the primitive Chinese mode of writing; while the Scandinavian and Germanic runes rather remind of the Tartar staves. Of a more advanced stage appears the Mexican pichne-writing, a system by which single syllables or words were expressed by phonograms. The Chinese system appears to combine both the ideographic and phonetic characters; but there is scarcely a doubt that even the phonetic signs are derived from ideographic ones. The step to the alphabetic system, however, was never taken by the Chinese.

When and how our present alphabet was invented has been matter of speculation from the earliest times. The myths of antiquity ascribed it to Thoth (q.v.) or to Cadmus, which only denotes their belief in its being brought from the east (Kedem), or being perhaps primeval. The Talmud ascribes it to a special revelation. It has been a question whether there were several original alphabetical systems, or whether one is to be assumed as having given rise to the various modes of writing now in use. Thus, three principal sources—Semitic, Chinese, Indian—are given by Klaproth. It is, however, now agreed on all hands that it is the Phenician character, as we now know it, to which we directly owe our own. See PHENICIA. From it many streams have flowed out. The principal of these appear to have been—first, the Semitic, in which the values of the letters have remained almost identical with those of the original Phenician, with exception, perhaps, of a few sounds added to them in Persian, for the purpose of expressing certain Indo-Germanic sounds not existing in Phenician. This class has further been subdivided into Hebræo-Samaritan and Aramaic, the latter embracing the

square or modern Hebrew, which is closely allied to the Palmyrene, the Estranghelo or Syriac, the Sabian, the Arabic in its different forms, the Mongol, the Pehlvi, Armenian, etc. The second or central division embraces the writing of Greece, Asia Minor, and Italy, from the Æolo-Doric, Etruscan, Umbrian, Oscan, and other but little known kinds, to the late Pompeian Graffiti. A further group would include the "Indo-Homerite" characters, and seems to have originated in central Arabia, whence it appears to have spread to Africa and India, where the Magadhi—the oldest variation the Phenician assumed here—gave rise to the five families of Devanaghari, Pali, Dravidian, Oceanian, and Thibetan. See PALEOGRAPHY.

Yet, when we speak of the Phenician as being the mother of all our known alphabets, we must not be understood finally to ascribe to the Phenicians the original invention of it in the first instance. We shall only indicate here that the theory to that effect, held by Gesenius and others, will probably, sooner or later, have to give way to the more recent results of De Rougé's investigations, who, with great show of probability, believes it to have been borrowed, or rather adapted from certain archaic hieroglyphics of Egypt. It would appear as if at some very archaic period the Phenicians had borrowed the hieratic signs then in use; as, indeed, the *prisse papyrus*, the oldest in existence, exhibits striking similarities with the Phenician characters. Instead, however, of simultaneously taking the Egyptian names for these characters, they invented new ones according to their own fancy, and to the supposed similarity of the characters to some particular thing. The Egyptian origin of the Phenician character, as confirmed by further researches, (see Taylor, *The Alphabet*, 1883), was affirmed of old by Tacitus (*Annal* xi, 14)—a curious case of old tradition verified.

We have in the course of this work treated at full length several points of this subject. See HIEROGLYPHICS, CUNEIFORM, ALPHABET, etc. We may therefore, for a fuller elucidation of the details, refer to those articles. We shall only add in this place that the manner of writing is very different with many nations. The Mexican picture-writing begins at the bottom; the Chinese and Japanese, as well as the Mongols, write in columns beginning from the top, and going from right to left. The Egyptian hieroglyphics have no fixed direction; but the hieratic and demotic, though the single letters are formed from right to left, always run from left to right; as is also the case in Ethiopic, cuneiform, and Indo-Germanic languages generally. The Semitic languages have retained the Phenician mode of writing from right to left—all but the numerals—a mode still retained in archaic Hellenic and Etruscan. By degrees, however, the writer not wishing to return to the beginning of the line, and continuing right underneath the last word penned, a double mode was introduced, called the boustrophedon—as the ox plows. Finally, this too was abandoned, and the direction from left to right was followed. About the many various styles of modification our characters have undergone in the course of time, the punctuation of the words, and the rest, we refer to ALPHABET. The materials and the instruments (see PAPYRUS, PEN, etc.) differed much at various times. Consult Steinthal, *Die Entwickelung der Schrift* (1852); Wuttke, *Geschichte der Schrift* (1872).

WRITING FLUIDS. See INK.

WRITING MACHINES. See TYPEWRITERS.

WRY'NECK, *Yunx*, a genus of birds of the woodpecker family (*picidæ*), having a short, straight, conical beak; a long extensile tongue, with a horny point; wings of moderate size; a rather short and rounded tail; the feet with two toes in front, and two behind. One species, the COMMON WRYNECK (*Y. torquilla*), is a summer visitant of Britain and the n. of Europe. From its appearing at the same time with the cuckoo, it has acquired the name of *cuckoo's mate*. It is common in the s. of England, but very rare in the northern parts of Britain. It is about 7 in. long, of a rusty ash color, irregularly spotted with brown and black. It feeds on caterpillars and insects, and is often seen on the ground near ant-hills, feeding on the ants and their "eggs." The construction of its tongue resembles that of woodpeckers, and enables it to seize its insect prey with wonderful celerity; the tongue is darted out, and retracted, so that the eye can scarcely follow it; the two posterior branches of the bones of the tongue being much elongated, and muscles for its extension attached to them. There is also a long gland on each side of the lower jaw, which secretes a glutinous mucus, so that insects adhere to the horny tip of the tongue. The wryneck generally makes almost no nest, but deposits its eggs on fragments of decayed wood in the hole of a tree. The young birds are easily tamed, and are great favorites with boys. In France, it is common for boys to tie a string to one of the legs of the bird, and to allow it to climb trees in search of insects. It climbs readily on their clothes. The name wryneck is derived from the habit which the bird has of writhing its head and neck quickly in various directions, with an undulating snake-like motion, which it does particularly if found in its hole in a tree, making at the same time a hissing noise, so as to alarm the intruder; but on his drawing back, it suddenly escapes. See illus., LARKS, ETC.

WULSTAN, or WULFSTAN, and sometimes WOLSTAN, a name of interest in connection with Anglo-Saxon history and literature. There are three individuals of the name

especially noticeable. — 1. A monk of Winchester in the 9th c., author of a poem, in Latin hexameters, on the miracles of St. Swithin, which is reputed the best Latin poem of that age produced in England. — 2. An archbishop of York, in 1003, author of two pastoral letters and several sermons in Anglo-Saxon, the most remarkable of which is printed in Hickes's *Thesaurus*, vol. iii. — 3. The well-known bishop of Worcester, and a saint of the English calendar. He was born at Icentum, in Warwickshire, about 1007, and educated at Evesham and Peterborough. He became a priest, afterward a monk, and prior of the monastery of Worcester, and ultimately, in 1062, bishop of that see. He lived through the troubles of the Norman conquest, and enjoyed the favor not only of the conqueror, but of William Rufus, and died in 1095, at the age of 87. He is by some reputed the author of the portion of the Anglo-Saxon Chronicle which extends from 1034 to the death of the conqueror.

WUNDT, William Max, b. Baden, 1832; studied medicine at Tübingen, Heidelberg, and Berlin; was a privat-docent at Heidelberg, 1857, and a prof., 1864. He was called to the chair of physiology at Zurich, 1874, and passed the following year at Leipsic. Among his works are *Die Lehre von der Muskelbewegung* (Studies on the Movement of Muscles), 1858; *Beiträge zur Theorie der Sinneswahrnemung* (Theory of the Perception of the Senses), 1862; *Vorlesungen über die Menschen und Thierseele* (Lessons on the Intellect of Men and Animals), 1863; *Lehrbuch der Physiologie des Menschen* (1865, 4th ed., 1878); *Untersuchungen zur Mechanik der Nerven und Nervencentren* (1871–76); *Grundzüge der Physiologische Psychologie* (1874); *Logik* (1880–83); *Essays* (1885); *Ethik* (1886); *System der Philosophie* (1889); *Hypnotismus und Suggestion* (1892). In 1883 he founded the *Philosophische Studien*.

WUPPERTHAL, a celebrated valley of Rhenish Prussia (q.v.), derives its name from the river Wupper, or Wipper, a small affluent of the Rhine, which rises between the towns of Wipperfürth and Hückeswagen, 26 m. n.e. of Cologne. Its course is first n., then n.w., past Barmen (q.v.) and Elberfeld (q.v.) — the chief town on its banks — then s.w. to its junction with the Rhine between Wiesdorf and Rheindorf, 7 m. below Cologne, after a course of 50 miles. The waters of the Wupper are very abundant, and for the length of its course it supplies motive-power to an extraordinary number (about 400) of mills, of various kinds. It is navigable for small craft below Solingen (q.v.).

WÜRTEMBERG, The Kingdom of, lies in 8° 15′ to 10° 30′ e. long., and 47° 35′ to 49° 35′ n. lat., is bounded on the w., s.w., and n.w. by the Grand Duchy of Baden; e., s.e., and n.e. by Bavaria; and s., for a few leagues, by the lake of Constance and Vorarlberg. Hohenzollern makes a deep indentation into the land from the s., and the entire boundary is very irregular. Detached pieces of territory belonging to Würtemberg also lie in the adjacent countries. Its greatest length, from the village of Simmringen in the n. to the lake of Constance in the s., is 139 m.; and greatest breadth, from the Katzenkopf, in the Black forest, eastward to the castle of Duttenstein in Nerestein, 105 miles. The following table gives the area and the population according to the census in 1895:

Circles (Kreise).	Area in Square Miles.	Population (1895).
Neckar	1,285	697,373
Black Forest	1,845	488,431
Jagst	1,985	398,887
Danube	2,418	496,460
Total	7,533	2,081,151

At the census of 1890 the population was 2,036,522. Würtemberg is fourth in population of the states of the empire, after Saxony and before Baden; but is third in point of size, having a greater area than Saxony.

The capital of Würtemberg is Stuttgart (q.v.). Ulm had (1895) 39,304 inhabitants; Esslingen, 24,031; and Heilbronn, 33,461; but Stuttgart has no rival as to population or importance.

Physical Aspect. — The surface of Würtemberg is composed of terraces of hill and dale, the lowest point being 437 ft. above the sea. In the Black forest circle the mountains attain the highest elevation, the Hornisgrinde rising to 3820 feet. One point of the Swabian Alps is 3327 ft. high. The valleys and plains average 500 ft. above the sea. Rich pastures, cultivated fields, orchards, gardens, hills covered with vines, and mountains with forests, give the most diversified scenery. In the s.e. are extensive peat-lands.

Rivers, Lakes, etc. — The most important rivers are: the Neckar (q.v.), with its affluents; the Danube, which receives the Iller; and the Tauber, a tributary of the Maine. The Neckar and its streams drain 4200 sq. m.; the Danube, 2037; the rivers which fall into the lake of Constance, 714; the Tauber, 315; and other water-courses, 168 sq. miles. The only lake in the interior is the Federsee, near Buchau, in the Danube circle. There is much traffic both by steam and sailing ships on the Neckar, and from Friedrichshaven, on the lake of Constance.

Railways have been constructed to the extent of (1895) 990 English m. from Bruchsal to Ulm, Ulm to Friedrichshaven, Bietigheim to Hall, Canstatt to the Bavarian lines, and from Plochingen by Tübingen and Rottweil into Baden and on to Schaffhausen. There are more than 511 post-offices, which forward 20,000,000 letters, 4,000,000 post-cards, and 22,000,000 newspapers annually. The postal expenditure in 1896–97 was 450,000 marks. Of telegraphs, there were 1500 miles in operation.

Geology, Mineralogy, etc. — The prevailing rocks are granite, gneiss, limestone, and various sandstones. Tourmaline, cobalt, bismuth, silver, malachite, chalcedony, gypsum, copper, rock-crystal, and iron occur. A great variety of fossils have been found. The peat-lands are extensive. Fire-clay of excellent quality, earths for dyeing, and native sulphate of lime, are worked. Building materials, from the granite of the Black forest to the tufa of the Alb valley, abound. Clay-band ironstone, yielding from 30 to 36 per cent. of iron, is worked in eleven different districts, and salt in five. The value of minerals raised in the kingdom in 1894 amounted to 1,088,537 marks. There are many springs of mineral water, those of Canstatt and Stuttgart being much frequented.

The climate is mild and healthy, but in the highlands the winters are long and cold. When w. winds prevail, the cold of winter and summer heat are less than in some countries in the same latitude. The greatest quantity of rain falls in summer. Of the total area about 25 per cent. is occupied by plains or level ground, 46 per cent. is hilly, and 29 per cent. mountain land. The soil is for the most part very fertile and well tilled. The vineyards are chiefly in the Neckar circle and that of the Jagst. The forests, grain, and pasture lands are nearly equally distributed throughout all the circles. Wheat, oats, barley, rye, potatoes, beans, maize, turnips, mangold-wurzel, lucerne, etc., are the principal agricultural products. There are extensive orchards in all parts of the land. Cherries, damsons, walnuts, peaches, apricots, and the more common fruits, are largely grown. Timber is largely grown and exported, especially from the Black Forest regions. Large and small cattle are plentifully reared. Large cattle, which in Würtemberg are generally fed in the stall, constitute the principal export of Würtemberg to Switzerland and neighboring lands. Forestry and the various branches of agricultural science are diligently promoted by numerous technical institutes. The acreage of the state forests, according to a report of 1897, was 418,904. The forests extend over the entire kingdom, and a considerable area is annually sown and planted with trees. At the head of the department of forests is the president and a board of four technical and four administrative officers, and one commander of the guards. The service is on an equal footing with the other branches of the civil service. The private forests of W. cover a somewhat wider area,—namely 528,794 acres. Wine-producing is an important occupation in W., and in 1896 the crop amounted to 11,287,984 gallons from vines covering an acreage of 42,002. During the preceding period of 69 years, from 1827 to 1895, the average product per acre was 570.6 gallons, or 16.3% less than the average product of 1896. In the latter year the import of wine and grapes from foreign countries amounted to only $\frac{1}{14}$ part of the home production.

Manufactures, Industries, etc. — The manufactures are chiefly linen, woolen, cotton, and silk fabrics. Wool and cotton spinning, bleaching, dyeing, printing, iron-founding, making machinery, cutlery, gold and silver articles, glass, porcelain, earthenware, tile, cabinet-work, sawing wood, carriage-building, grinding corn, book-printing, and the cognate trades are principal industries. There are many oil- mills, beer-breweries, and brandy distilleries. Water is to a large extent the motive-power employed in the manufactories and mills. In Würtemberg 3,493,151 hectoliters of beer were produced in 1894–95. The exports are chiefly grain, cattle, wood, salt, oil, leather, woolen, cotton, and linen goods, beer, etc.

Religion, Language, Education, etc. — The population of Old Würtemberg is almost entirely Lutheran. The numbers of each denomination in 1890 will be seen in the subjoined table:

Circles.	Evangelical Lutherans.	Roman Catholics.	Other Christians.	Jews.
The Neckar	595,212	59,607	4,633	5,463
" Black Forest	357,227	121,015	1,631	1,432
" Jagst	275,073	123,696	722	3,494
" Danube	179,136	305,276	465	2,250
Total	1,406,648	619,594	7,451	12,639

In 1895 there were 1,441,240 Evangelical Lutherans; 620,474 Roman Catholics; 7451 other Christians; and 11,887 Jews.

Several dialects of German are spoken, of which the Swabian and Franconian are the most general. Wurtemberg has been the native country of many distinguished men, of whom a few may be mentioned. In poetry, Schiller, Uhland, Wieland, Kerner; in theology and philosophy: Brentz, Œcolampadius, Bengel, Schelling, Hegel, Baur, Strauss, etc.; in science and art: Kepler, Stiefel, Tobias Mayer; the botanists Joseph and Karl Friedrich Gärtner; the chemist Schönbein, the painters Eberhard Wächter, Hetsch, and the famed sculptor Dannecker.

Education is compulsory and there must be at least one public school in every commune. In 1895 there were 2303 elementary public schools, having 4729 teachers and attended by 301,082 persons, 80 *realschulen* with 9120 students, 68 grammar schools, 18 gymnasia, 7 lyceums, and there is a university at Tübingen. In 1892–93, 6,100,000 marks were appropriated by the state to educational purposes. At Hohenheim is an agricultural and botanical institution, in which farming, management of forests, and gardening are scientifically taught. Stuttgart has a polytechnic school which is one of the best institutions of the kind in Germany. There is not in Wurtemberg a person above ten years of age who cannot both read and write.

Revenue, Expenditure, etc.—In 1896–97 the revenue was estimated at 70,900,447 marks, and the expenditure at 71,744,325. The public debt on April 1, 1896, was 468,051,000 marks. Of the revenue, 14,310,840 marks came from commercial revenues, 15,910,050 marks from direct taxes, 15,400,630 marks from customs, etc., and 14,600,130 marks from other indirect taxes. Of the expenditure, 18,334,562 marks went as matricular contribution to the German empire, 20,836,542 marks towards the national debt, and 10,712,022 to purposes of religion and education. The troops of Würtemberg form the 13th corps d'armée of the German empire.

Government, etc.—The crown is hereditary in the male line, and failing that, in the female. Freedom of the press and religion are enjoyed. The privy council consists of a president, the six ministers of state, and members named by the king. The legislative body is composed of two chambers—the first being formed of princes of the royal family, nobles, and members appointed by the king, the last named not exceeding a third part of the whole; the second chamber is composed of 13 representatives of the knighthood, 6 Protestant general superintendents, the bishop and 3 others of the Catholic clergy, the chancellor of the university, 7 representatives from the cities Stuttgart, Tübingen, Ludwigsburg, Ellwangen, Ulm, Heilbronn, and Reutlingen, with a representative from each of the 63 bailiwicks. Members of the second chamber are not eligible as such before reaching their 30th year. The king has the power of proroguing or dissolving the chambers; but in the latter case a new election must take place within six months. As a member of the reconstituted German empire (1871), Würtemberg has 4 votes in the federal council, and 17 representatives in the diet of the empire.

History.—The earliest inhabitants of Würtemberg were probably Celts; but when the Romans came first to know the country, it was held by the Suevi, who were succeeded by the Alemanni and the Franks. In 1090, Conrad, count of Würtemberg, possessed a castle near Cannstatt, and limited territories, which were largely added to by Ulric I. from 1246 to 1265. Other extensions were gained by Eberhard I. between 1279–1325; by Ulric II., who, though a man of peace, added Tübingen; Eberhard II., who secured Teck, Gutenberg, Kirchheim, Herrenberg, and other places. By the marriage of Eberhard IV. with the countess of Montbéliard, that county became connected with Würtemberg. At his death, the possessions were divided between his two sons, each of whom enlarged his portion; and a few years after their death, Eberhard V. secured a reunion, and the land advanced rapidly in power and importance. In 1495, the emperor Maximilian raised Eberhard to the rank of duke, with the title of Eberhard I. In 1519, duke Ulrich, having offended the Swabian league by some arbitrary acts of oppression exercised upon the imperial free city of Reutlingen, was forcibly ejected from Würtemberg, and did not reconquer his estates till 1534. While Eberhard III. was duke (1628–74), Würtemberg suffered much in consequence of the thirty years' war. Ludwig Eugene (1793–1795) having taken part in the war against the French republic, a French army attacked and compelled him to resign Montbéliard, and pay 8,000,000 francs.

With duke Frederick II., who succeeded his father in 1797, the most important period in the history of Würtemberg begins. In 1800, compelled by the French to flee from his dukedom, he got back, by the peace of Lunéville, all his territories except Montbéliard, and instead, had others granted, with the rank of elector. Having aided Napoleon in the war against Austria, at the peace of Presburg (Dec. 26, 1805), Würtemberg was further enlarged, and made a kingdom. After the battle of Leipsic, Frederick abandoned the cause of Napoleon, and concluded a treaty with Austria, in which his lands were guaranteed. His reign was arbitrary; and internal troubles were thickening around him, when he died (Oct. 30, 1816), and was succeeded by his son, William I., who was born at Lubin, in Silesia, Sept. 27, 1781. He was cordially welcomed to the throne, and the expectations of his subjects were realized. His first acts were to reduce the expenditure, and introduce other reforms, prominent among which was the liberal constitution of 1819. In 1848–50, a strong agitation was kept up with the view of obtaining some permanent modifications in this constitution, but without success. For nearly fifty years he reigned over a people steadily increasing in prosperity, and died June 25, 1864, at Rosenstein castle. His son, Charles I., succeeded him, and dying in October, 1891, gave way to William II. See Germany. See illus., Heraldry, vol. VII.

Würzburg, a former sovereign bishopric or ecclesiastical principality of the German empire, was founded in 741 (according to other accounts, 742 or 746), and received

endowments from the Frankish kings, which were afterward increased by the German emperors. The first bishop was Burkhardt, who was consecrated by Boniface. The patron saint was Kilian (q.v.), who is said to have preached the gospel here as early as 688. By good management and economy, the bishops were able to acquire numerous possessions of the neighboring Frankish proprietors; and out of these was gradually formed the extensive sovereign bishopric of Würzburg, ruled over by the prince-bishop as duke of Franconia. The ducal title and authority were first conceded about 1120. In spiritual matters, the bishops were under the archbishop of Mainz. The area of the bishopric was as much as 1827 sq.m., with a pop. of 250,000, and a yearly revenue of 500,000 guldens. At the peace of Lunéville (1801), the bishopric of Würzburg, like the other spiritual principalities of Germany, was secularized; and in 1803, the greater part of it was conferred on the elector of Bavaria as a secular principality. The last prince-bishop received a pension, and died at Bamberg in 1808. At the peace of Presburg (1805), Bavaria gave up Würzburg to the grand duke Ferdinand of Tuscany, and the principality was raised to the dignity of an electorate. In 1806, the elector Ferdinand joined the confederation of the Rhine, and from that time took the title of grand duke of Würzburg. By a decree of the Vienna congress, the grand duke received his hereditary state of Tuscany, and Würzburg reverted to Bavaria (1815). At present the greater part of the bishopric belongs to the circle of Lower Franconia.

WÜRZBURG, capital of the former principality of Würzburg, now of the Bavarian circle of Lower Franconia, is situated in a beautiful valley on both sides of the Main, 60 m. s.e. of the city of Frankfort. The number of inhabitants amounted (1895) to 68,714, of whom 11,000 are Protestants. Among the public buildings, the most distinguished are the episcopal palace or residence, rebuilt 1720–44, one of the most magnificent royal residences in the world; and the spacious and excellently fitted-up Julius hospital, established in 1576. Of the numerous churches, the most worthy of notice are the richly decorated cathedral, which was rebuilt in the 11th and following centuries; the Marien-kapelle, one of the most beautiful monuments of old German art, with 14 statues of the 15th c. by Tilmann Riemenschneider; and the Neumünster church, containing the bones of St. Kilian. The streets adjoining the palace square are wide and straight, but most of the others are narrow and crooked. In front of the Julius hospital there is a bronze statue of the founder, bishop Julius, by Wiedemann, founded in bronze by Miller; a monument of Walther von der Vogelweide (q. v.) stands in a niche outside the Neumünster kirche.

The university of Würzburg was founded in 1582 by bishop Julius, who also founded the hospital above mentioned. The endowments for both institutions were taken from the possessions of the convents that were destroyed during the peasant war (q. v.). In order to promote the study of medicine, the hospital was put in connection with the university, the professors of medicine being made physicians and surgeons to the hospital; this connection has all along kept the medical faculty in high reputation, and promoted the prosperity of the university as a whole. The present medical staff includes several names of European reputation, among others Kölliker (q. v.). All the professors of the theological faculty are thoroughgoing Infallibilists. There is also a faculty of political economy. In 1896–97 there were 82 professors and teachers, and 1365 students. The library contains above 200,000 vols. In the musical institute, any one can receive instruction gratis in singing or in playing on any instrument; and twice a week there are great musical pieces performed. In Würzburg, besides the university, there is a gymnasium, a Latin school, a district agricultural and trade school, a seminary for Catholic priests, and a seminary for training teachers, an orthopedic institution, a veterinary school, a school for midwifery, a swimming school, a society for the improvement of the arts and manufactures, and a female society for the encouragement of skill in arts and handicrafts among women. Besides the Julius hospital, there are asylums for the deaf and dumb and for the blind, and other charitable institutions. The manufactures are woolen stuffs and cloth, mirror-glass, leather, tobacco, railway carriages, and sparkling wines. The fortress of Marienberg, built on the site where Drusus founded a castle, is situated on a hill 400 ft. high, on the left bank of the Main, outside the town. The campaign of the Prussian army of the Main ended with an action fought before Würzburg, July 27, 1866. The fortifications have been demolished. The industry of Würzburg has greatly prospered during the last ten years.

WÜRZEN, a small walled t. of Saxony, 15½ m. n.e. of Leipsic, picturesquely situated and surrounded by romantic valleys, on the Mulde, here crossed by two bridges. Pop. '90, 14,635, employed in brewing, bleaching, weaving, and hosiery-work. It is a station on the Leipsic and Dresden railway.

WY'ANDOT, a co. in n.w. central Ohio ; 404 sq.m. ; pop. '90, 21,722, chiefly of American birth. Co. seat, Upper Sandusky.

WYANDOTS', a tribe of North American Indians, of the Iroquois family, the Hurons of the French writers, who called themselves Wendats or Yendats, first known at Montreal, where, in the middle of the 17th c., they became Roman Catholics under the instructions of the French missionaries. Having, as allies of other tribes, become involved in a war with the Iroquois, they were nearly exterminated, and the remnant emigrated to the country around lake Superior; then gathered at Mackinaw, 1670, under

the care of father Marquette; thence came to Detroit, where they furnished 400 warriors to the English in 1812. In 1829 they were settled, to the number of 600, on the head-waters of the Sandusky river in Ohio; and in 1832, by a treaty with the United States government, removed to Kansas, where the few remaining have acquired the rights of citizenship, each having of their divided lands a farm of 40 acres.

WYANDOTTE, a co. in n.e. Kansas, adjoining Missouri, and bounded on the n. by the Missouri river; 160 sq.m.; pop. '90, 54,407, chiefly of American birth. Co. seat, Kansas City.

WYANDOTTE, formerly the co. seat of Wyandotte co., Kan., but now included in Kansas City (q.v.).

WYANDOTTE, a city in Wayne co., Mich.; on the Detroit river, and the Lake shore and Michigan Southern and the Michigan Central railroads; 12 miles s.w. of Detroit. It is a manufacturing city, with iron furnaces, rolling and flour mills, and iron and steel works, and has a public library, high school, state banks, and weekly newspapers. Pop. '90, 3817.

WYANDOTTE CAVE, in Crawford co., Ind., is over 20 m. long. Its greatest height is about 250 ft., and its greatest width about 300 ft. It is remarkable for the number and beauty of its crystals, exceeding, it is said, even the Mammoth cave in that respect. Among the remarkable features are the "pillared palace," with clusters of stalactites, "monument mountain," 175 ft. high, with 3 massive stalagmites at its top; and the "mammoth hall," 350 by 245 ft.

WYANT, A. H., b. Ohio, 1836; began his career as a landscape painter in Cincinnati. He studied for some years under Hans Gude in Düsseldorf, and afterwards in London, returned to America and settled in New York, 1864. He was one of the early members of the American Soc. of painters in water-colors, was elected an associate of the National acad., 1868, and an academician, 1869. Among his pictures are, "Scenes on the Upper Susquehanna," 1869; "A View on Lake George," 1875; "Gathering Shells," 1876; "New England Landscape," 1878. He excelled as a painter of wild scenery. D. 1892.

WYATT, Richard John, an English sculptor of great eminence, was b. in Oxford street, London, on May 3, 1795. He belonged to a collateral branch of the family which made the name of Wyatt famous during two centuries in connection with architecture and sculpture, sharing their descent from a stock of yeomen long settled at Weeford in Staffordshire. Having the bias of his family towards art he became an articled pupil of Charles Rossi, R.A., sculptor, and afterwards a student of the Royal academy, whose medal was twice awarded to him during his pupilage. He afterwards passed some time in Paris, studying under Bosio; and from Paris, in 1821, he went to Rome, and entered the studio of Canova, where he had Gibson for a fellow-pupil. The remainder of his life was spent in Rome, in complete devotion to the prosecution of his art; and he died at Rome on May 29, 1850. His youth had shown great promise in the estimation of painters like Lawrence and sculptors like Canova; and the works which he produced in rapid succession early placed him in the front rank of English sculptors.

WYATT, Sir Francis, about 1575–1644; b. England; gov. of the colony of Virginia, 1621–26 and 1639–41. He established the first courts of justice.

WYATT, Sir Matthew Digby, an eminent English architect and writer on art, was b. in 1820 at Rowde, near Devizes, Wilts. After his apprenticeship and studying for some time at the Royal academy, he, in 1844, went to the continent and made a diligent study of the architecture of Italy, France, and Germany. He returned to England in 1846, and in 1848 published *Geometrical Mosaics of the Middle Ages.* He not only studied decorative art in his own profession, but also in its various applications. In 1849 he made a report to the society of arts on the Paris exposition of industry; and soon after, as secretary to the royal commissioners, took an important part in the arrangements of the 1851 exhibition. He took a similar interest in the Sydenham Crystal Palace. In 1856 he was appointed architect to the East India company, for whom he designed several important public works—bridges, barracks, and hospitals. In 1865 he was made honorary member of several foreign academies, and in 1866 received the royal gold medal of the Royal institute of British architects. He was knighted in 1869, and in the same year was chosen Slade prof. of fine arts at Cambridge. His chief art publications are, *Metal Work and its Artistic Design* (1852); *Industrial Arts of the Nineteenth Century* (1853); *Art Treasures of the United Kingdom* (1857); *Fine Art* (1870); *Architect's Handbook in Spain* (1872). He died in May, 1877.

WYATT, Sir Thomas, was born in 1503, at Allington castle in Kent. His father, sir Henry Wyatt, of a family originally of Yorkshire, stood high in favor with Henry VII.; and not less so with Henry VIII., who succeeded him. In 1515 the young Wyatt was entered at St. John's college, Cambridge, where in due time he took his degrees of bachelor and master of arts. While still very young, he was married to Elizabeth Brooks, daughter of lord Cobham. Through his father's influence, a career at court was open to him. In this sphere he was thoroughly well qualified to succeed; he was one

of the most accomplished men of his day; of a noble presence and fine manners, and withal dexterous and subtle in the management of affairs, though of unimpeached honor and integrity. In 1536 he received at the hands of the king the honor of knighthood, and the next year he was made high sheriff of Kent. Though necessarily involved in much perilous court intrigue, he continued—though once or twice in some hazard of losing it—to retain the favor of the king, and was frequently employed by him in positions of trust and importance. His chief service was rendered as English ambassador at the court of Charles V., in which capacity he acquitted himself with much diplomatic tact and skill. In 1542, in token of the king's appreciation of his services, he received a grant of lands at Lambeth; and the year after, he was named high steward of the king's manor at Maidstone. He had now very much withdrawn himself from public life, and lived for the most part retired at Allington. On Oct. 11, 1542, he died at Sherborne, of a fever contracted, it is said, on an over-hasty journey caused by a sudden summons to attend the king.

Among the other accomplishments of Wyatt was that of verse, which he seems to have begun to cultivate early, and continued through life to practice. During his life he had acquired considerable reputation as a poet; and in 1557 his poems, along with those of the celebrated Surrey, were published in London. As marking a stage in the progress of our early literature, they hold a permanent place. His love poetry is somewhat overrun with conceits derived from the study of Italian models; but some of the shorter pieces are models of grace and elegance. His satires also possess very considerable merit. More lately, in 1815, an edition of his works, in two volumes, was published in London.

WYATT, Sir Thomas, surnamed "the younger," to distinguish him from the preceding, of whom he was the only son, was born about 1520. After a wild and riotous youth, he raised a body of men at his own expense, and did good service at the siege of Landrecies (1544), displaying considerable military talent; and continued in honorable service on the continent till 1550. In 1554, when the Spanish match was in agitation, Wyatt joined the insurrection, and led the Kentish men to Southwark, after gaining considerable successes over the royalists; but failing to capture Ludgate, he became separated from the main body of his followers, and was taken prisoner, and soon after executed, April 11, 1554.

WYCHERLEY, William, a comic dramatist of the period of the restoration, was born at Clive, near Shrewsbury, in 1640. His father, a cavalier squire of £600 a year, sent his son to France at the age of 15; and during his residence on the banks of the Charente, the youth was a favorite at the court of the governor of Angoulême, whose accomplished wife, the Mme. Rambouillet of Voiture, converted him to the creed of the church of Rome. On his return to England in 1660 Wycherley studied a short time at Oxford, where he was reconciled to the Anglican church, and he was entered of the middle temple. His first comedy, *Love in a Wood*, was acted with great applause, and published in 1672, and it was followed by three other successful comedies, *The Gentleman Dancing-master* (1673); *The Country Wife* (1675); and *The Plain Dealer* (his best work, 1677). About 1680 the dramatist was married to a young and rich widow, the countess of Drogheda, whom he had met at Tunbridge. The lady was distractedly jealous of him, kept him from frequenting the court, which lost him the favor of the king, and watched him closely wherever he went. She did not live long, and she left him the whole of her fortune; but his succession to the estate was disputed, and an expensive lawsuit ensued, the costs of which, added to personal debts, fairly broke down the unlucky dramatist. He was committed to the Fleet, and suffered to languish there neglected for seven years. He was partly relieved by the bounty of James II.—probably because he returned to the communion of the church of Rome—and he succeeded to the patrimonial estate in Shropshire by the death of his father. This did not, however, much relieve him, as the estate was heavily mortgaged, and strictly entailed. He was on bad terms with the heir-at-law, his nephew; and on purpose to injure this relative, Wycherley, at the age of 75, married a young girl, on whom he settled a jointure; and eleven days after this transaction—the last and perhaps the most scandalous act of his life, as Macaulay describes it—the old dramatist died. His death took place in Dec., 1715, and he was interred in St. Paul's church, Covent garden. Besides his comedies, Wycherley published a volume of wretched *Miscellany Poems* (1704), and another volume, partly consisting of "moral reflections," was published after his death. The comedies of Wycherley, on which his fame rests, reflect the literary taste, the manners, and vices of the times in which he lived. They are, in truth, grossly immoral and profligate. They have, however, some literary excellence. The language is clear and forcible, the dialogues often witty and lively, some of the characters vigorously drawn, and the observations and maxims scattered throughout the different scenes are shrewd and sensible, and expressed in a terse, sententious style. Wycherley was the founder of that school of artificial comedy which Congreve, Farquhar, and Sheridan carried to its highest perfection, imparting to it an airy grace and brilliancy far above the reach of its first master.

WYCLIFFE, John de, the greatest of all the "reformers before the reformation," was born in 1324, and is supposed to have been a native of the parish of the same name, near

the town of Richmond in Yorkshire. He studied at Oxford; but of his early university career nothing is known.

Wycliffe first emerges into public notice in 1361, when his name appears as master of Balliol hall—as Balliol college was then called. In May of the same year he was instituted to the rectory of Fylingham in Lincolnshire, and shortly after resigned his mastership and went to reside at his rectory. About 1363 he took his degree, and began to read lectures on divinity at Oxford, in which his anti-Romish views were first expounded. In 1368 he exchanged the rectory of Fylingham for the living of Ludgershall, in Bucks; and in 1374 was presented to the parish of Lutterworth, of which he remained priest till his death.

In the great struggle maintained by Edward III. and his parliament against the pretensions of the papacy, regarding the exaction of certain tribute-money which had been granted by king John in acknowledgment of the fealty of the kingdom to the Roman see, Wycliffe, who had been advanced to be one of the king's chaplains, was called upon to reply to a defense of the papal claim, which had been anonymously sent abroad. This he did publicly at Oxford in an ingenious and powerful manner, and thus early showed his antipathy to the pretensions of Rome. A clear evidence of his growing reputation is furnished by his appointment in 1374, as second in a commission sent to Bruges to confer with the papal legate as to certain abuses on the part of the papacy complained of by the English parliament. It was probably on his return from this mission, that Wycliffe was promoted to a prebend in the diocese of Worcester, and at the same time presented to the rectory of Lutterworth in Leicestershire. Here he labored with great zeal, preaching not only on Sundays, but on the several festivals of the church, and showing himself "a most exemplary and unwearied pastor." Here also he began at length to speak his mind as to the papacy. The insight into papal doings which he had received at Bruges seems to have confirmed suspicions previously forming in his mind, and he is said, soon after his return to England, to have styled the pope "antichrist," "the proud worldly priest of Rome, the most cursed of clippers and purse-kervers" (cutpurses). Then began in real earnest his troubles with the hierarchy. In the beginning of 1378, he was summoned to a meeting of convocation, to be examined for his opinions. He obeyed the summons, but he appeared attended by his friend John of Gaunt and others. A great tumult ensued, the London citizens bursting into the chapel, and frightening the synod of clergy, who were ordered to sist proceedings. The papal authority was then invoked against him, and Gregory VI. issued several bulls, three addressed to the archbishop of Canterbury and other bishops, one to the king, and one to the university of Oxford, commanding an inquest into the erroneous doctrines attributed to the reformer. Wycliffe was accordingly again summoned before the prelates at Lambeth; but on this occasion also he was favored by circumstances, and escaped merely with an injunction to refrain from preaching the obnoxious doctrines.

These proceedings only served to make Wycliffe a more thorough reformer. He now entered upon his great work of translating the scriptures, and circulating them among the common people. He had a great retinue of poor preachers, to aid him. He also challenged the doctrine of transubstantiation; though he always believed in some kind of real presence. Many of the people, the burghers and the middle class, heard him gladly, and matters seemed tending to an open rupture with the papacy. But the times were not as yet ripe for this. Many who otherwise sympathized with the reformer were afraid of his views about transubstantiation. He was especially summoned to answer on this head, first, before a synod at the Greyfriars, London, and finally before convocation in 1382. He appeared, and defended himself with great subtlety and power. His defense was unavailing. Twenty-four "erroneous" statements were picked out of his works, which were in consequence condemned and ordered to be burned. He was banished from Oxford, but was allowed to retire to his parish of Lutterworth. His health was already shattered by hard work and many anxieties, and on the last Sunday of the year 1384, he was struck down by paralysis while conducting public worship, and two days afterward expired. Wycliffe appears to have been a man of simple faith and of earnest and manly courage. He made a strong impression upon his age; an impression there is reason to think not entirely effaced even to the time of the reformation. The Lollards, as his disciples were called, were to be found not only among the poor, but in the church, the castle, and even on the throne. Political mischances, however, overtook the party in the following century, and only a few traces of it survived here and there when the movement of the 16th c. began. See Huss.—T. Arnold published 3 vols. of Wycliffe's select works in 1871, and F. D. Matthew his hitherto unprinted *English Works* in 1881. See Lechler's *Johann von W.*, trans. by Lorimer; and *W.'s Place in History*, by Montague Burrows (1882).

WY'COMBE, Chipping or High, a municipal and parliamentary borough in Bucks, surrounded by beech-clad hills, 28 m. w.n.w. of London, on the Wye, a small affluent of the Thames. The church of All Saints is a large and handsome building, erected in 1273; it is in the Norman and early English style of architecture, and consists of a body and two aisles, and, with the chancel, is 180 ft. long. The tower is 96 ft. high, and was built in 1522. There are corn and paper mills on the Wye; beech-wood chairs are made here, and lace-making is carried on. At two miles' distance is the village of West Wycombe. Since 1867 the borough returns one member to parliament. It is connected

with the Great Western Railway. Pop. '81, of municipal borough, 10,618; '91, 13,435.

WYE, a river of Wales and England, of picturesque beauty and considerable importance, an affluent of the Severn, has its origin in two copious springs which issue from the s.e. side of Plinlimmon, not two miles from the head-water of the Severn (q.v.). It flows in a s.e. direction through Montgomeryshire and Radnorshire, forming the s.w. and s. boundary of the latter, e.s.e. to the middle of Herefordshire, and then s., dividing in its lower course the county of Monmouth from that of Gloucester, and entering the estuary of the Severn below Chepstow. Length of course, 130 m., for 70 m. of which to Hereford it is navigable for barges, though large vessels cannot ascend above Chepstow bridge. At Chepstow (q.v.) the tide rises higher than at almost any other place in Great Britain. The chief affluents of the Wye are the Lug and Ithon on the left, and the Monnow, the Caerwen, and Irfron on the right. The part of the river which separates Monmouth from Gloucester is that chiefly visited for its singular beauty.

WYKEHAM, William de, was b. at Wickham, in Hampshire, in 1324. He was educated at Winchester. On Oct. 8, 1366, by the king's recommendation, he was elected bishop of Winchester. He was consecrated Oct. 10 of the year following. Meanwhile, he had been appointed lord high chancellor of England; in which office he was confirmed Sept. 17, 1367. He resigned on Mar. 14, 1371, on a petition being presented to the king against the government remaining too long in the hands of men connected with the church. He now devoted himself to various objects of lasting usefulness. His preparatory college or school at Winchester was opened for teaching in 1373; but the building of the college was not begun till 1387. It was finished in 1393. In the college which he instituted at Oxford, teaching had also begun in 1373; but the building of "St. Mary's college of Winchester in Oxford" was not begun till 1380; it was finished in 1393. He began the rebuilding of Winchester cathedral in 1395, and just lived to see it finished. Meanwhile, he had become the object of resentment to the duke of Lancaster and party, at whose instance he was indicted for pecuniary defalcation, and other crimes alleged to have been committed by him as keeper of the privy seal and lord chancellor. He was heard in 1376 before a commission of peers, bishops, and privy councilors, declared guilty, and a severe sentence was passed upon him. It was, however, ultimately commuted into a fine, which was remitted on the accession of Richard II. in 1377. He was one of the council of 14 appointed to the king in 1386, and in May, 1389, he was again made lord chancellor. He continued in office till Sept. 27, 1391, when he resigned; and from this date he appears to have taken little active part in public affairs. He was present in the parliament held on Sept. 30, 1399, when Richard II. was deposed. He was also present in the first parliament of Henry IV. He died at South Waltham, Sept. 27, 1404.—See *Life* by Dr. (afterward bishop) Lowth (Lond. 1754). Wykeham of Wykeham was one of the most munificent benefactors of the English church; but he was not a fanatic. He loved learning, order, civilization, and purity of manners; and as bishop of Winchester, signalized himself by his rigorous reformation of ecclesiastical abuses; but he had not the slightest tendency toward *Protestantism*, affording, in this respect, a most striking contrast to his great contemporary Wycliffe (q.v.). Wykeham of Wykeham may be taken as the type of a class of English churchmen both before and after the reformation—men who are destitute of zeal on questions of doctrine, but zealous for the dignity, culture, and practical efficiency of the church.

WYLIE, Samuel Brown, d.d., 1773–1852; b. Ireland; graduated at the university of Glasgow, and removed to Philadelphia in 1797; tutor in the university of Pennsylvania, 1798; pastor of First Reformed Presbyterian church, Philadelphia, 1801–52; professor in the theological seminary of his denomination, 1809–51; conducted also a classical school with success for many years; professor of ancient languages in the university of Pennsylvania, 1828–45, and vice-provost thereof, 1838–45; and was an author of numerous works.

WYLLYS, George, 1570–1645; b. England; settled at Hartford, Conn., 1638; and was successively, assistant, deputy-governor, and governor of the colony, being elected to the last office in 1642, and commissioner of the united colonies.

WYLLYS, Samuel, 1739–1823; b. Conn.; graduated at Yale college in 1758. He commanded a regiment at the siege of Boston in 1775, and for the rest of the war was col. of a Connecticut regiment. He was secretary of state of Connecticut, 1796–1809. This post was occupied by members of the Wyllys family for 98 years.

WYMAN, Jeffries, 1814–74; b. Mass.; educated at Harvard, where he took the degree of m.d. in 1833. He was for a time demonstrator of anatomy at the Harvard medical school, and afterward curator of the Lowell Institute, Boston. After studying in Europe, he was elected in 1843 professor of anatomy and physiology at Hampden-Sidney college, Richmond, Va. Four years later he became professor of anatomy at Harvard university, where he remained till his death. He at once began making collections in comparative anatomy and archæology, and he succeeded in forming extensive and valuable collections. His rank as a comparative anatomist was high. He published nearly 70 scientific papers. He became curator of the Peabody museum of archæology at Cambridge, Mass., on its foundation in 1866.

AREA AND POPULATION OF IDAHO, MONTANA, AND WYOMING BY COUNTIES.

(ELEVENTH CENSUS: 1890.)

IDAHO.

	Area in Square Miles.	Population.		Area in Square Miles.	Population.
Ada	2,500	8,368	Kootenai	5,600	4,108
Alturas	6,700	2,629	Latah	1,080	9,173
† Bannock	.....	.....	Lemhi	5,400	1,915
Bear Lake	1,100	6,057	Logan	5,800	4,169
Bingham	10,500	13,575	Nez Percé	1,610	2,847
Boisé	4,000	3,342	Oneida	2,700	6,819
†Canyon	.....	.....	Owyhee	7,800	2,021
Cassia	4,500	3,143	Shoshone	4,400	5,382
Custer	3,500	2,176	Washington	2,700	3,836
Elmore	3,000	1,870			
†Fremont	.....	.....	Total	84,290	84,385
Idaho	11,400	2,955			

MONTANA.

	Area in Square Miles.	Population.		Area in Square Miles.	Population.
Beaver Head	4,200	4,655	Madison	4,250	4,692
Cascade	2,600	8,755	Meagher	7,000	4,749
Choteau	27,280	4,741	Missoula	18,550	14,427
Custer	26,580	5,308	Park	5,558	6,881
Dawson	26,680	2,056	†Ravalli	.....	.....
Deer Lodge	5,085	15,155	Silver Bow	915	23,744
Fergus	6,762	3,514	†Teton	.....	.....
†Flathead	.....	.....	†Valley	.....	.....
Gallatin	2,295	6,246	Yellowstone	3,105	2,065
†Granite	.....	.....			
Jefferson	1,850	6,026	Total	145,310	132,159
Lewis & Clarke	2,600	19,145			

WYOMING.

	Area in Square Miles.	Population.		Area in Square Miles.	Population.
Albany	4,500	8,865	Natrona	5,475	1,094
*Big Horn	12,260	.....	Sheridan	2,775	1,972
Carbon	7,800	6,857	Sweetwater	10,230	4,941
Converse	6,600	2,738	Uinta	14,830	7,881
Crook	5,250	2,338	Weston	4,830	2,422
Fremont	12,000	2,463			
Johnson	4,000	2,357	Total	97,575	60,705
Laramie	7,025	16,777			

* No population. † Organized since 1890.

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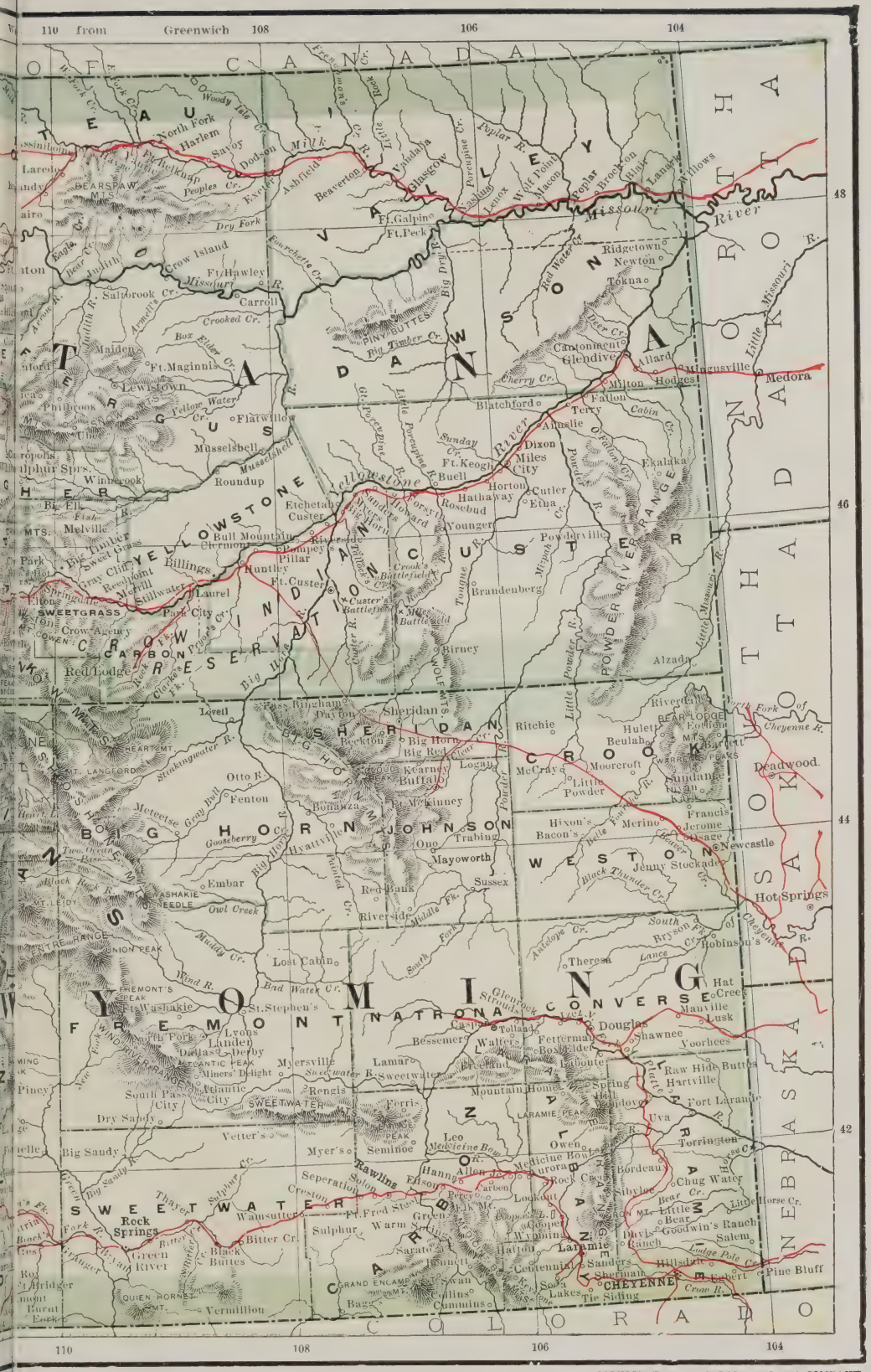

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WYMAN, R. H., b. N. H., 1822; entered the navy, and served in the Mexican War, being present at the capture of Vera Cruz. In the civil war he commanded the *Pawnee* at Port Royal, and was subsequently placed at the head of the Potomac flotilla. He rose to the rank of capt., 1866, and in 1872 was made commodore. After the war he was in charge of the hydrographic office, Washington. He d. 1882.

WYNTOUN, Andrew, an old rhyming Scottish chronicler, lived in the beginning of the 15th century. Except that he was prior of the monastery of St. Serf on loch Leven, and wrote *The Orygynale Cronykil of Scotland*, well known and valued by students of that kind of curious literature, almost no information regarding him has been preserved. Though with the usual proportion of extravagant fable, his work is not without considerable historical importance; while philologically it has very distinct value, as a specimen of the old Scotch, then as nearly as might be identical with the contemporary dialect of England. The *Orygynale Cronykil* consists of nine books or cantos, of which only the last four are devoted to Scottish history; the first five giving a fragmentary outline of the history and geography of the ancient world. From his quotations, Wyntoun seems to have been a well-read scholar for his time. His style is not essentially different from Barbour's, and his versification is the same—the pleasant octosyllabic. In 1795 a splendid edition of this work was published by Mr. D. Macpherson; and this edition has been revised and enlarged by D. Laing, LL.D. (vols. i. and ii. 1872; vol. iii. 1879).

WYOMING, a n. western state, lies between lat. 41° and 45° n.; long. 104° and 111° w.; is bounded on the n. by Montana; on the e. by South Dakota and Nebraska; on the s. by Colorado and Utah; on the w. by Utah and Idaho; length from e. to w., about 355 m.; breadth, about 275 m.; gross area, 97,890 sq. m., or 62,649,600 acres.

Wyoming was organized as a territory in 1868, July 25, from areas previously in Dakota, Idaho, and Utah, but derived more remotely from the original territories of Nebraska, Utah, and Oregon, a portion having at one time belonged also to Washington. The advent of the Union Pacific railroad was followed by the settlement of Cheyenne in the summer of 1867 and of Laramie City in the spring of 1868. The growth of Wyoming was slow for many years, the Indians having been troublesome. In 1889, at a convention held Sept. 3–30, a constitution was framed which was adopted Nov. 5 by a vote of 6272 to 1923. Admission to the union was denied until the following year, when a bill passed Congress by a strictly party vote and was signed by the President, July 10. The main chain of the Rocky Mts. extends across W., entering from Colorado at the s.e. corner and passing out at the n.w. corner. Its principal divisions are the Shoshone Mts. in the n.w.; the Teton and Gros Ventre ranges in the w.; the Wind River and Sweetwater ranges in the w. central part; the Big Horn Mts. in the n.; the Black Hills in the n.e., and the Laramie Mts. in the s.e. There are many peaks of great altitude, among them Mt. Hayden, 13,691 ft., and Fremont Peak, 13,790 ft. The Laramie mts. form the eastern boundary of the Laramie plains, a plateau with an elevation of about 7000 ft., comprising meadow expanses and rolling and hilly ground. The most notable topographical feature of W. is the Yellowstone valley in the northwest corner, in which an area of over 3300 sq. miles has been reserved as a National park. Here are the largest and most numerous geysers (or intermittent thermal springs) in the world; numbering about 4000. About 50 of them throw columns of water 200 ft. high and they deposit chiefly lime and silica. The temperature of the calcareous springs is from 160° to 170°, that of the others rising to 200° or more. Other objects of interest are the cañons of the Yellowstone river and the surrounding ranges, always snow-covered. The Yellowstone and its tributaries, the Big Horn, Tongue, Powder, Little Missouri, and Cheyenne, drain north and northeastern Wyoming; the Snake or Shoshone and Green river and its tributaries, the west and southwest; and the north fork of the Platte, with its tributaries, nearly all the rest. The geology embraces in the mountain ranges Devonian, carboniferous, triassic, Jurassic, and cretaceous rocks, succeeding each other in regular order; while the elevated plains are mostly cretaceous, overlaid with tertiary sands, gravel, and drift, with occasional extensive deposits of lignite. In 1895 the output of coal exceeded 2,246,911 short tons, valued at nearly $3,000,000. Gold is mined in the Black hills, the Wind river, and the Big Horn mts. In the Medicine Bow Mts., west of Laramie City, placer mining is successfully carried on. Silver is found in all these sections and native copper, especially in the vicinity of Laramie City. There are immense deposits of nearly pure iron in several places; also red oxide of iron, hematite, and chrome iron. Granite, marble, mica, kaoline, graphite, mineral paint, corundum, pyrites for making acids, bismuth, gypsum, silica sand, sulphur, asphalt, ozokerite, gilsonite, brick and potters' clays, salt, soda, and petroleum are found in the Laramie region and elsewhere.

The mountains are covered with a thick growth of pine, spruce, and hemlock trees of great size; on the foot-hills grow pine, spruce, aspen, walnut, elm, ash, box elder and red cedar; along the river bottoms are found two species of cottonwood and several species of willow. The principal wild animals are the grizzly bear, black bear, wolf, prairie wolf, badger, wolverine, otter, porcupine, mink, skunk, little ermine, elk, antelope, deer, prairie dog, and jack rabbit.

The climate varies with the altitude, being very severe on the higher mountains, and comparatively mild in the sheltered valleys. The average mean temperature of the year is, for Wyoming as a whole, about 44°. In the mountains it falls in some years as low

as 36°, while on the plains in the east it averages 45°. The summers are usually cool, though sometimes the temperature for a day or two rises to 100°. On the Laramie plains very little snow falls. The rainfall is small, varying from 8 to 13 in.; but in all the arable portions there are streams flowing at such an elevation that irrigation is not difficult. The soil of the foot-hills and river bottoms is very fertile, but many sections require irrigation to make them productive. One canal, fed by the Big Sandy river, an affluent of Green river, irrigates 270,000 acres. The soil in general is better suited to turnips, potatoes, pease, beans, etc., than to cereals. The director of the United States geological survey has estimated the amount of land in Wyoming that may be reclaimed by irrigation at 15,000,000 acres. In 1891 the number of acres under irrigation was given at 2,172,000, with over 3000 separate ditches. The state is noted for the abundance and excellence of its grasses, on which a great stock-raising industry has been created. The farm and ranch animals exceed $17,000,000 in value, sheep predominating—over 1,500,000 head—and the wool clip (1896) aggregated 10,369,130 pounds; of agricultural crops the most valuable is hay, averaging over $3,000,000 per annum.

Manufactures in Wyoming are of minor importance. The U. S. census of 1890 reported for Wyoming, 190 manufacturing establishments, employing $1,411,184 capital and 1144 persons, paying $878,646 for wages and $1,084,432 for material, and having a combined output valued at $2,367,601. The principal manufactures are flour and grist mill products, lumber and saw-mill products, cigars, and brick and tile. Mining has become one of the chief interests, although a large part of the state is still undeveloped in this respect.

Banking and Insurance. — On Oct. 31, 1896, there were 11 national banks in operation, with capital, $860,000; deposits, $1,858,595; reserve, $582,854; and outstanding circulation, $212,227; 5 state banks, with capital, $72,000; deposits, $161,771; and resources, $274,246; 8 private banks, with capital, $164,349; deposits, $633,325; and resources, $841,712; and over 50 life and fire insurance companies licensed to carry on business in the state.

Railroads. — The state has nearly 1500 miles of railroad, which represent a total investment of over $80,000,000, and an expenditure for construction and equipment of over $61,000,000.

Churches and Schools. — The strongest denominations numerically are the Roman Catholic, Mormon, Methodist Episcopal, Lutheran, Protestant Episcopal, Presbyterian, Congregational, and Baptist. The public school population exceeds 21,000; enrollment, 11,500; value of school property, $429,000; and annual expenditure, $210,000. There are a state university at Laramie, a normal and scientific college at Rawlins, a collegiate institute (Cong.) at Big Horn, the academy of the Holy Child Jesus (R. C.) at Cheyenne, and public, law, and school libraries at Cheyenne and Laramie.

Government. — The capital is Cheyenne. The governor, secretary of state, auditor, treasurer, and superintendent of public instruction are elected for terms of four years each; appointive officers serve from two to six years each. The legislature, holding sessions biennially, must comprise at least one senator and one representative from each county. The right to vote and hold office shall not be denied or abridged on account of sex. This confirms a right acquired by the women of Wyoming as early as 1868. Perpetuities and monopolies are forbidden. All laws of a general nature have a uniform operation. The judicial power is vested in a supreme court of three justices, district courts, probate courts, and justices of the peace. The legal rate of interest is 8 per cent., but 12 per cent. is allowed by contract. The territorial institutions not educational are: an asylum for the insane at Evanston, a state hospital at Rock Springs, a soldiers' and sailors' home at Cheyenne, and state penitentiaries at Laramie and Rawlins. In 1892 the state cast three electoral votes for Harrison and Reid; in 1896 the same number for Bryan and Sewall.

In 1896 the assessed property valuations exceeded $30,000,000, and in 1897 the total debt, all bonded, was $320,000. The population in 1880, with seven cos., was 20,789; in 1890, with one unorganized and 12 organized cos., it was 60,705, of whom 59,275 were white, and 1430 colored (922 negroes, 465 Chinese, 43 civilized Indians), 45,792 natives and 14,913 foreign born. Most of the Americans were born in the territory, or in New York, Pennsylvania, and Ohio; and the foreigners were from Great Britain and Germany. There are 13 cos. The largest cities and towns in 1890 were, Cheyenne, 11,690; Laramie, 6388; Rock Springs, 3406; Rawlins, 2235; Evanston, 1995; Newcastle, 1715; and Carbon, 1140.

WYOMING, a co. in w. New York, bounded on the s.e. by the Genesee river; 606 sq. m.; pop. '90, 31,193. Co. seat, Warsaw.

WYOMING, a co. in n.e. Pennsylvania; about 396 sq. m.; pop. '90, 15,891. Coal and iron are found. Co. seat, Tunkhannock.

WYOMING, a co. in s. West Virginia, drained by the Guyandotte river; about 660 sq. m.; pop. '90, 6247. Co. seat, Oceana.

WYOMING VALLEY, a beautiful fertile valley on the Susquehanna river, in Pennsylvania, 21 m. long by 3 wide, surrounded by mountains 1000 ft. high, its name supposed to be a corruption of the Indian *Maughwauwame*—large plains. It was purchased about 1765 by a Connecticut company from the Delaware Indians; but the settlers were soon dispersed by hostile savages. In 1769, 40 families came from Connecticut,

but found a party of Pennsylvanians in possession, and for several years there were continual contests of the settlers with the Indians, and with each other. The Connecticut colony finally succeeded, and their town of Westmoreland had 2,000 inhabitants. In 1776 they armed for their own defense against the English and their Indian allies; but in 1778, most of their troops were called to join the army under Washington. June 30, a force of 400 British provincials, or Tories, and 700 Seneca Indians, led by col. John Butler, entered the valley, and were opposed by 300 men, under col. Zebulon Butler. On July 3, the settlers were driven to the shelter of fort Forty, with the loss of two-thirds of their number, many soldiers and inhabitants being murdered; a half-breed Indian woman, called queen Esther, having, in revenge for her son's death, tomahawked fourteen with her own hand. On the 5th, the remnant of the troops surrendered, and they and the inhabitants were either massacred or driven from the valley, which was left a smoking solitude. Campbell's *Gertrude of Wyoming*, founded upon the stories of this disaster, contains exaggerations and misstatements, notably that of attributing the leadership to Brandt who was not in the expedition. The disputes between the Connecticut and Pennsylvanian settlers were not finally settled till 1788. The valley is now one of the most flourishing districts in the state.

WYTHE (pronounced With), a co. in s.w. Virginia, about 496 sq.m.; pop. '90, 18,019, chiefly of American birth. Iron and coal are found. Co. seat, Wytheville.

WYTHE, George, 1726–1806; b. Va.; educated at William and Mary College. He came into the possession of a large fortune by the death of his parents during his minority, and fell into dissipated habits; but when about 30 years of age, changed his course, and began to study law. He was admitted to the bar in 1757, and soon rose to eminence. He represented William and Mary college in the house of burgesses for several years, and in 1764 framed a remonstrance against the stamp act. In 1776 he was a commissioner with Jefferson and others to revise the Virginia statutes. He was a delegate to congress, 1775–77, when he was elected speaker of the house of delegates, and appointed judge of the high court of chancery; and in 1786 he was made chancellor, an office which he held for about 20 years. He was law professor at William and Mary college, 1779–89, and a member of the Virginia convention which ratified the federal constitution in 1787. He died by poison. He emancipated his slaves. He published *Decisions by the High Court of Chancery* (1795).

WYTTENBACH, Daniel, 1746–1820; b. Bern, Switzerland; educated at the universities of Marburg, Göttingen, and Leyden. He became professor of Greek and of philosophy at Amsterdam, 1771; and in 1799 was made professor of elocution at Leyden. He edited Plato's *Phædo*, and the *Moralia*, and *Animadversions of Plutarch*, and published a number of philosophical and critical works in the Latin language.

WY'VERN, a fictitious monster of the middle ages, frequently occurring in heraldry. It resembles a dragon, but has only two legs and feet, which are like those of the eagle.

X

X, THE last letter of the proper Latin alphabet, and the last but two of the English. It is in reality a superfluous character, being equivalent in English, as it was in Latin, to *ks* or *gs*. In form, it corresponds to the Greek χ, but in power to Greek ξ. It was a later addition to the Latin alphabet, having been introduced, according to Corssen, between the time of the decemvirate and the fall of Veii. Some Roman scholars did not acknowledge the character, but wrote *cs*, *gs* instead; and this substitution frequently occurs in inscriptions (e.g., *ucsori*, for *uxori*). At one period of Roman literature, *xs* was often written for *x*; e.g., *saxsum*, *lexs*. In the popular pronunciation, the guttural element of the character gradually disappeared, until, in the later period of the empire, *x* was undistinguishable from *ss* or *s*; thus, inscriptions show *visit* for *vixit*, *milex* for *miles*. This change survives in modern Italian, which substitutes *ss* or *s* for the Latin *x*, as *sasso* = *saxum*; *straneo* = *extraneum*; and uses *x* only in foreign words. In Spanish, in the beginning of words, *x* has a guttural sound, something between *ch* and *y*. In German, the use of *x* is mostly confined to foreign words; in native words the sound is usually represented by *chs*, as *wachsen*, to wax or grow, though some write, e.g., *axe* for *achse*.—In algebra, *x* is the usual symbol for the unknown quantity which is to be determined.

XANTHEINE and **XANTHINE OF FLOWERS.** The coloring matters of various flowers have been carefully examined by Fremy and Cloez, who believe that the various tints may be referred to three distinct substances, of which one is of a blue or rose color, while the other two are yellow. These pigments have received the names of *cyanine*, *xanthine*, and *xantheine*; the first being derived from the Greek *kyanos*, sky-blue; and

the last two from *xanthos*, yellow. None of these substances have, however, been extracted in a pure condition, and hence nothing definite can be stated regarding their composition or properties.

XANTHINE, $C_5H_4N_4O_2$, was first described by Dr. Marcet, the able chemist, who regarded it as a very rare constituent of urinary calculi, and from its composition he gave it the name of *uric oxide*. During the last ten years it has been proved to be a normal ingredient (although to a very small amount) of human urine, and has been found in the brain, the spleen, the pancreas, and the liver of the ox; in the thymus gland of the calf; and in the muscular tissue of the horse, the ox, and of fishes; as well as in the liver of various animals. Calculi composed of this substance are extremely rare, the total known number obtained from the human subject being less than half a dozen. They are of a light-brown cinnamon color, assume a waxy appearance when rubbed, and consist of concentric layers easily separable from one another. *Xanthine* occurs in such very minute quantities in the various tissues, and is so rare an ingredient of calculi, that it is unnecessary for us to enter into any description of its properties, further than to state that, when dried, it exists as a yellowish-white powder, which assumes a glistening appearance when rubbed, and exhibits no signs of crystallization under the microscope; moreover, the chemical difficulties of detecting traces of this substance are so great that we shall not attempt to describe its tests. It seems to be intermediate to uric acid and hypoxanthine, both in a chemical and a physiological point of view. The composition of uric acid is represented by the formula $C_5H_4N_4O_3$, that of xanthine by $C_5H_4N_4O_2$, and that of hypoxanthine, now called sarcine, by $C_5H_4N_4O$. The former two occur simultaneously, not only in the urine, but in the spleen, the liver, and the brain; while xanthine is not only invariably accompanied by larger or smaller quantities of hypoxanthine, but the latter can be made by the oxidizing action of nitric acid to yield a product from which xanthine (in place of hypoxanthine) may be obtained by a process of reduction. Xanthine must be regarded as a higher stage of oxidation of hypoxanthine, and a product of the regressive metamorphosis of the tissues, which, in the ordinary condition of the system, is excreted in a more highly oxidized form of urea, uric acid, etc.

This substance is stated to have been found by Göbel in some oriental bezoars extracted from the intestines of certain ruminating animals. It is most probable that the supposed bezoars were in reality urinary calculi.

XANTHIPPÉ, the wife of Socrates, has acquired the reputation of having been an arch termagant, doubtless not without some foundation. It ought, however, to be remembered that her naturally infirm temper must have been not a little tried by the small concern manifested by Socrates in the regulation of his domestic affairs, which appears occasionally to have made it difficult for Xanthippe to "make both ends meet." Socrates himself, it is known, had completely mastered his naturally strong appetites and passions, and had acquired a temper of perfect serenity. It is quite natural, then, that contrast-lovers and story-mongers should, as a foil, match so great a practical philosopher with a woman of such an ungovernable temper as Xanthippe is said to have been. She herself, if we can trust Plato, appears to have really loved her husband, and he at his death committed her tenderly to the care of his friends. Many stories are told of her, as of every other notable character in history, to illustrate her peculiar tendency, but it is difficult to say how much credit ought to be given them.

XANTHORRHÆ'A. See Grass Tree.

XANTHOXYLUM, a genus of trees and shrubs, the type of the natural order *xanthoxylaceæ*. an order closely allied to *rutaceæ*, and chiefly distinguished from it by unisexual flowers. including more than 100 known species of trees and shrubs, having opposite simple or pinnate leaves with pellucid dots, and no stipules, chiefly natives of warm climates, and more particularly of the warm parts of America. The order is generally characterized by pungent and aromatic qualities, which are strongly developed in the genus xanthoxylum itself, *X. fraxineum*, a North American species, a very low, deciduous tree, with leaves somewhat like those of the ash, common from Canada to Virginia, is called Toothache Tree, from the use made of the hot acrid bark and capsules for the relief of toothache. It is also in high repute in the United States as a remedy for chronic rheumatism, for which it is administered in the form of a powder, in doses of from 10 grains to half a dram three times a day. Some of the species are popularly called Peppers in their native countries, as in India and Japan, where they are used as a substitute for pepper. The bark of *X. fraxineum* is a powerful sudorific and diuretic, and other species possess similar qualities; some are febrifugal, and the seeds and unripe capsules of some are gratefully aromatic.—To the order *xanthoxylaceæ* belong the ailanthus (q.v.) and the White Iron-wood (*vepris undulata*) of the cape of Good Hope, the wood of which is very hard and tough, and is much used for agricultural implements.

XANTHUS, the name of the capital of the ancient Lycia, anciently called Arina, a city of the Tramilæ, or Solymi, the primitive inhabitants. It lies at the s.w. corner of Asia Minor, and near the village of Kounik. From the earliest historic times to that of Crœsus, the Lycians appear to have been independent under native rulers; but after the fall of Sardis and the capture of Crœsus, the Persian conqueror Cyrus sent an army for

the conquest of Lycia, led by Harpagus, in 546 B.C. The most desperate resistance was made by the Lycians, and the people of Xanthus burned themselves in their citadel, rather than surrender to the conqueror, only 80 families surviving the catastrophe. Reduced to a Persian satrapy, they sent 50 ships to the expedition of Xerxes against Greece, and contributed to the revenues of Persia. Little is known of the history of this town till the days of Alexander the Great. Alexander took Xanthus, which is said to have made as determined a resistance as it did on the former occasion. In the war which ensued among the successors of Alexander, Ptolemy took Xanthus from the garrison of Antigonus; and the city subsequently passed into the possession of the Ptolemies and Seleucids. After the defeat of Antiochus it was ceded by the Romans to Rhodes, but subsequently had its liberties restored. In the civil war between Brutus and the Triumvirs (43 B.C.), Xanthus was taken by Brutus. The inhabitants a third time destroyed themselves and their families, and few survived the capture. From that time Xanthus belonged to the Roman empire, and suffered in the earthquake in the reign of Tiberius; but Lycia did not lose all its freedom till the time of Claudius, who reduced it to a province. Xanthus was situated 70 stadia, or 9 m., from the sea, on the left bank of the Sibres or Sibrus, the Greek Xanthus, or Yellow river, on a plateau of elevated ground, of nearly rectangular shape, the elevated parts close to the river rising 200 feet. The most remarkable edifices in the city and its vicinity, according to ancient authors, were the Sarpedonion, or temple of Sarpedon; that of the Lycian Apollo; and Letôon, or temple of Leto. On the elevated ground, or acropolis, stood the so called Harpy Tomb, and an ancient theater of Greek workmanship; while in the other part of the city which lay to the e. was a mixture of Greek and Roman buildings. The whole city and its environs contained numerous temples and tombs. The discoveries of sir C. Fellows in 1838 revealed the city of Xanthus, its temples and its monuments, and they appear to fall into the following classes: 1. The sepulchers of the early inhabitants, placed inside the wall in shape of square columns, with step-shaped bases, and sepulchral chamber on the summit. The most remarkable of these is the Harpy Tomb, so called from the subject of the bas-reliefs being the Harpies bearing off the daughters of Pandarus, king of Lycia—executed in a style resembling the earliest efforts of oriental Greek art. Another, with a frieze of lions and hunters in Persian style, and the inscribed obelisk, with long Lycian inscription and some Greek verses, apparently of the time of Artaxerxes Longimanus, and made about 466 B.C. 2. The tombs of the age of the Persian subjection, with roof-shaped tops and ridges, and imitation of wood-work, the sepulchral chamber for the principal dead being at the summit, the others in the middle and base, the sides ornamented with reliefs of a later style of art. Of a later style, but of more beautiful art, was the Ionic peristyle temple or monument of 14 columns, with a solid cella, placed on a base or pedestal, both temple and base ornamented with friezes, supposed to represent the conquest of Lycia by Harpagus, and with figures between the columns. The friezes represent hunts and feasts, the combats of Lycians and Persians, and taking of the city of Xanthus by the latter—the whole treated in a style not unlike the school of Phidias and his successors. These sculptures have been supposed to represent the exploits of Harpagus, or the suppression of the revolt of the Cilicians by a Lycian satrap, and to have been made between 450 and 387 B.C. This temple was discovered by sir C. Fellows in 1840–44. See illus., SCULPTURE, vol. XIII.

The language found on the monuments of Lycia, written in an alphabet of 25 letters, is an Aryan dialect, distinguished by a prevalence of vowels. The letters, with two exceptions, are archaic Greek, and borrowed from by no means the oldest form of that language. The syntax and inflections are Aryan or Indo-European, but many of the roots are different from the languages of that family, although certain words may be referred to well-known equivalents—as *goda*, "lord," to the Persian; *tedeeme*, "son," to the Slavonic; and *ladé*, "wife," to the Anglo-Saxon. Some words, too, resemble the Zend. The presence of many Greek words barbarously transcribed can also be well recognized in the different inscriptions, and some few derived from their Persian conquerors—as *gssatrape*, or "satrap." The inscriptions are generally short and sepulchral, and follow the well-known formula commonly used under the Roman empire, and are sometimes accompanied by Greek versions or translations, helping to explain the Lycian. One inscription alone, recording the exploits of one of the family of the Harpagi after the battle of Eurymedon (466 B.C.), on the so-called obelisk of Xanthus, is of any length. The language seems to have lasted from about the 5th c. B.C. to the 1st c. A.D.—Rawlinson, *Herodotus*, vol. i. pp. 311, 673; *Synopsis of the Contents of the British Museum*, 1855, p. 105; Fellows, *Asia Minor* (Lond. 1839); *Discoveries in Lycia* (1841); Birch in the *Archæologia*, vol. xxx. pp. 176–204.

XAVIER, ST. FRANCIS, a celebrated missionary of the Roman Catholic church, was born of a noble family at Xavier, in Navarre, April 7, 1506. Having received his early education at home, he was sent, when in his 18th year, to the college of Sainte Barbe, at Paris, where he formed the acquaintance of Ignatius de Loyola (q.v.), with whom he ultimately became associated in the foundation of the Jesuit society. Under that head will be found detailed so much of his history as regards the first establishment of the order, and the early labors of its founders in Rome. It was while he was engaged in these early labors of the society in Rome, that

Xavier attracted the notice of the representative of John III. of Portugal at Rome Govea, who suggested to the king the idea of sending out members of the new order as missionaries to the Portuguese colonies in the east. Xavier was chosen for this purpose in the place of Bobadilla, who had been originally appointed, but was prevented by sickness from going on the expedition. Having sailed from Lisbon, April 7, 1541, and wintered at Mozambique, he arrived at Goa, May 6, 1542, and presented to the bishop his letters of authorization from pope Paul III. Xavier's first proceeding, on finding the excessively depraved condition of the European Christians settled in India, was to endeavor, by stirring up among them a spirit of penance and religious fervor, to remove the great obstacle to the efficacy of his preaching to the native population, which was presented by the evil example of the professing Christians of the colony. His efforts in this preliminary reformation were eminently successful, and he was equally blessed in his labors among the pearl-fishing population of the coast, from cape Comorin to the island of Manaar. After a stay of more than a year in this region he returned to Goa, and with a fresh staff of assistants visited the kingdom of Travancore, where, in the space of a single month, he baptized 10,000 natives. Passing thence to Malacca, where he was re-enforced by three other Jesuit missionaries, sent by Ignatius de Loyola in compliance with Xavier's earnest solicitations, and having achieved great success among the residents of the coast, he proceeded, in 1546, to the Banda islands, to Amboyna, and the Moluccas. In all these places his success was extraordinary. Having thus effected a first establishment of the Gospel in many places, he resolved to retrace his steps, and revisit the several scenes of his preaching. He arrived at Malacca in 1547, and thence by Manassar, near cape Comorin, where he stayed for some time, he passed to the island of Ceylon, where he converted the king of Kandy, with many of his people. In May, 1548, he returned a second time to Goa. His great object now was to carry out a project for the conversion of the Japanese empire, which had been suggested to him by a Japanese of high rank, whom he had attached to himself at Malacca, and who accompanied him to Goa. This Japanese, whom, with two of his domestics, he converted and baptized, became a most valuable auxiliary. Through his aid, Xavier was enabled during the voyage to acquire so much of the Japanese language as enabled him to translate into Japanese and explain the Apostles' creed; and although his success in the first island which he visited was very insignificant, yet at Firando, and afterward at Miako, his preaching was attended with extraordinary fruits. At the latter place he had failed signally upon his first visit, which was made in a very poor and humble guise; but having returned with a more imposing train, and under circumstances of greater outward distinction, he obtained a ready and favorable hearing, and made so lasting an impression that the mission he founded continued to flourish for above 100 years, until the final expulsion of Christianity from the Japanese empire. His mission to Japan occupied about two and a half years; and in Nov., 1551, he sailed from Amanguchi for the purpose of returning to Goa to organize a mission to China. Touching at Malacca upon his voyage, he endeavored to concert with the governor an embassy, in the name of the king of Portugal, to China, under cover of which he hoped to effect an entrance for his missionary enterprise, but on his return from Goa to Malacca, he found a new governor, who was opposed to any such attempt; and he was obliged to adopt the expedient of sailing in a merchant-ship to the island of Sancian, near Macao, which was at that time the trading depot of the Chinese with the merchants of Portugal. From Sancian, Xavier, having procured a Chinese interpreter, hoped to induce one of the native merchants to land him secretly on the coast; but in this hope also he was baffled by the fears of the Portuguese, who dreaded for themselves the vengeance of the Chinese authorities upon this infraction of the law. This disappointment, coupled with the privations and labors to which he had been exposed, brought on a violent fever, and under the combined weight of mental depression and physical sickness, this Christian hero sunk upon the very threshold of what he had looked to as the great enterprise of his life, in the island of Sancian, Dec. 22, 1552. His remains were conveyed to Malacca, and thence with great solemnity to Goa, Mar. 15, 1554. Many miracles, attested by numerous witnesses, were reported of Xavier in almost all the stages of his career. Among these there have been some who reckoned the miraculous gift of tongues. The evidence of these miracles was submitted to the usual process of inquiry at Rome; and many miracles having been established by the ordinary canonical process, Xavier was "beatified" by Paul V. in 1619, and "canonized" by Gregory XV. in 1622, his festival being fixed upon Dec. 3. His only literary remains are a collection of letters, in 5 books, 8vo (Paris, 1631), and a Catechism, with some short ascetic treatises. His Life, by Père Bouhours, was translated into English by James Dryden. There is a Latin Life by Tursellino (Rome, 1594); in Italian by Bartoli and Maffei; in German by De Vos (1877); and in English by Venn (1862) and Coleridge (1873).

XEBEC, an armed vessel of great speed, formerly used by the Algerine corsairs. It carried three masts, on which square or lateen sails could be set. The bow and stern were remarkable for the small angle they made with the water. The sides were low, and the upper deck of great convexity, that the water might readily flow off through the scuppers. As this rendered them inconvenient for walking on, gratings were laid at

the sides of the deck, to avoid the convexity. The crew walked dry on these gratings, while the water flowed out underneath. Xebecs carried from 16 to 24 guns.

XENIA, city and co. seat of Greene co., O.; on Shawnee creek, and the Cincinnati, Hamilton, and Dayton, and the Pittsburg, Cincinnati, Chicago, and St. Louis railroads; 55 miles s.w. of Columbus. It is the seat of Wilberforce university for colored students (Amer. Meth. Epis.), the theological seminary of the United Presbyterian church, and the State soldiers' and sailors' orphans' home, and has a court-house in a park in the center of the city, city hall, co. jail, city workhouse, numerous churches, national banks, several hotels, electric lights, university, seminary, and public libraries, and daily, weekly, and monthly periodicals. The city is widely known for its manufactures of twine and cordage, and has also saw and planing mills, marble and granite works, and paper, shoe, pump, and carriage factories. Xenia was settled in 1804 and incorporated in 1808; is in the beautiful Miami valley, 3 miles from the Little Miami and 12 miles from the Big Miami rivers; and is surrounded by a fertile agricultural country, abounding in water and limestone. Pop. '90, 7301.

XENIA, in ancient Greece and Rome the gifts given by the host to his guests. Martial calls the 13th book of his epigrams, which deals with subjects connected with this exercise of hospitality, *Xenia*. In 1797 Goethe and Schiller, borrowing this title, published in the *Musenalmanach* some 400 epigrams, in criticism of literary men and affairs. The work excited great interest at the time. Goethe's later-published *Zahme Xenien* contains criticism of a much milder character.

XENOCRATES, an ancient philosopher, was b. at Chalcedon 396 B.C., and died 314. At an early age, he attached himself to Plato, and in course of time, was so much esteemed for his proficiency in philosophy and high moral character, that he was thought worthy of succeeding Speusippus, Plato's successor, in the presidency of the academy. This post he filled most creditably for 25 years. He wrote numerous treatises upon dialectics, physics, and ethics, and drew with unusual precision the boundaries between these three departments of philosophy. Of these works merely the titles have been preserved; and what is known of his doctrines is gathered only from notices of them contained in various authors. He introduced into the academy, to a greater degree than before, the mystic Pythagorean doctrine of numbers, in connection with the *ideas* of Plato. Zeus, the father, ruling in heaven, he called Unity, as being uneven number and spirit; the world-soul, which operates through all things liable to motion and change, he styled Duality. This divine world-soul dwells in the heavenly bodies, the Olympic gods, the elements of nature, and also in terrestrial demons, whom he regarded as intermediate between gods and men. In his ethical teaching, he aimed at making the Platonic doctrines more directly applicable to ordinary life in individual cases, and pitched his standard of excellence very high. He held that virtue is in itself valuable, while other things are only so conditionally, and that it extended to thoughts as well as actions. He was himself of irreproachable character, of a well-balanced mind, and temperate in his habits without cynicism. His conversion of the youthful debauchee Polemo into an earnest, virtuous man, and his disregard for wealth, as shown by his refusal of the offers of Philip and Alexander, are the best-known incidents in his long, useful, and virtuous career.

XENOPHANES, founder of the Eleatic school of philosophy, was b. at Colophon, in Asia Minor, about 580 B.C., or, according to others, about 40 years earlier. He spent the greater part of a life which was prolonged beyond his 90th year, in banishment. He passed many years in Sicily, and resided for some time at Elea (whence adj. *Eleatic*), in Lucania. He composed many poems, historical, didactic, and elegiac, which have all perished, except a few fragments. He employed his poetry as the instrument for disseminating his philosophical tenets. He was the first to maintain the Eleatic doctrine of the oneness of the universe; and recognizing clearly the unity and perfection of the Deity, he attacked the prevalent mythology and the practice of attributing to the godhead a human form and human weaknesses. He was thoroughly in earnest, but his logic was confused and contradictory. While he held the existent to be identical with the Deity, and regarded it as the basis of phenomena, he also maintained that the divine essence was neither finite nor infinite, neither moved nor unmoved: not finite, for then it must be limited by another, whereas God is one; nor, on the other hand, infinite, for only non-being is infinite, as having neither beginning, middle, nor end. The distinguishing tenet of Xenophanes is his monotheism; and as a philosophical rhapsodist, he sought to inculcate it, though he failed to express it in a clear and systematic manner. His speculations are skeptical in their tendency, and appear to have had great influence upon succeeding philosophers. His explanations of physical phenomena were crude; but one is recorded in which he has anticipated modern geology. From the shells and marine petrifactions found on mountains and in quarries, he inferred that the surface of the earth had risen gradually out of the sea. In the 18th c., Voltaire could give no better explanation of the fact of sea-shells being found on the mountains of Spain, than the supposition that they were the scallop-shells dropped by pilgrims journeying to and from the shrine of St. James. See ELEATIC SCHOOL.

XENOPHON, celebrated as a general, historian, and philosopher, was b. at Athens 435 B.C. At an early age, he became a pupil of Socrates, and is said to have been saved from death by that philosopher at the battle of Delium. At the age of 40 or thereabouts, he joined the expedition of the younger Cyrus against his elder brother, Artaxerxes Mnemon, king of Persia. After the battle of Cunaxa, and the treacherous massacre of the Greek generals, Xenophon played an important part in the adventurous retreat known in history as the retreat of the ten thousand; and it was his courage and conduct that contributed mainly to its success. After having returned to Asia Minor, Xenophon led a portion of his forces upon a pillaging expedition, and amassed wealth enough to enable him to live the life of a country gentleman. Before retiring, he served under Agesilaus, the Spartan general, against the Persians; and at Coronea fought against his own countrymen. Sentence of banishment had been previously passed upon him at Athens, probably for his share in the Cyrean expedition. His sympathies were entirely Spartan. He soon afterwards settled at Scillus, a small town near Olympia, in Elis, under Spartan protection, where he lived upwards of twenty years, occupying himself with hunting, agriculture, and writing. He is not mentioned as having ever returned to Athens, though his sentence of banishment was repealed, and his two sons were in the Athenian division which aided the Spartans at Mantinea. At last, Xenophon was driven from his retreat at Scillus by the Eleans, and took refuge in Corinth, where he probably died, 359 B.C. His works are numerous, and to judge by their titles and number, all extant. His style is simple, elegant, but rather monotonous and deficient in vigor. As a philosopher, he holds no very high rank. He possessed excellent practical talents, was a humane, sensible, religious man, but seems to have had neither genius nor taste for speculative philosophy. His principal works are the *Anabasis*, or narrative of Cyrus's expedition and the retreat of the ten thousand; a history of Greece in continuation of Thucydides; the *Cyropædia*, or education of Cyrus the elder —a sort of political romance, in which Cyrus is drawn as the model of a wise and good ruler. In the latter work, Xenophon clearly shows his preference of a well-regulated monarchy to the democracy of his native country. He wrote besides the reminiscences (*Memorabilia*) of Socrates, a series of dialogues intended to refute the charges upon which that philosopher was executed; also treatises on hunting, on the horse, the revenues of Athens, and domestic economy. Standard editions of Xenophon as a whole or in part are those of Krüger, L. Dindorf, Schenkl, Cobet, Zurborg, and Hug. There is a lexicon to Xenophon by Sturz. The best English version is that of Dakyns (1893). See the monograph by A. Croiset (1873).

XERES-DE-LA-FRONTE'RA, or **JEREZ-DE-LA-FRONTERA**, an important town of Spain, in the province of Cadiz, and 14 m. directly n.e. from Cadiz, near the right bank of the Guadalete, and on the railway between Cadiz and Seville. The houses are generally well built, and the streets and squares clean, spacious, well paved, and well lighted. The wealthy wine-merchants mostly reside in the suburbs. Xeres-de-la-Frontera is an ancient town supposed by many to be the *Asta Regia Cæsariana* of the Romans. Xeres-de-la-Frontera has manufactures of woolen cloth and leather, and a considerable trade in corn; but all these are of little consequence in comparison with its wine trade. *Sherry* derives its name from Xeres-de-la-Frontera. Some of its *bodegas*, or wine-stores, are of vast dimensions. They are not wine vaults, but stores erected above ground. The greater part of the wine is exported to England. Pop. '87, 61,708.

XEROTINE SICCATIVE, a compound of boiled linseed oil and certain metallic oxides or salts, and, like similar compounds bearing the common name of "driers," is largely used for mixing with oil colors, that they may readily dry. Salts forming very unstable compounds when mixed with oil, have come into use and constitute highly explosive substances.

XERXES I. (the name is perhaps akin to Sanskrit *kshatra*, king), king of Persia, was the eldest son of Darius and his second wife Atossa, and was appointed successor by his father, in preference to Artabazanes, his eldest son by his first wife, whose children were all born before Darius became king. Darius died in the beginning of the year 485 B.C., in the midst of his preparations for a third expedition against Greece. Xerxes, after having subdued the rebellious Egyptians, and appointed his brother Achæmenes governor, gave his whole attention to the completion of the preparations begun by his father, which occupied nearly four years. Immense hordes of men were gathered together from all parts of the vast Persian empire, from the steppes of Central Asia, from the banks of the Indus and its tributaries, and from the interior of Africa; an enormous fleet was furnished by the Phenicians and other maritime nations subject to Persia; stores of provisions sufficient to support the immense army were collected at different points along the intended route of march. A bridge of boats, an English mile in length, under the superintendence of Egyptians and Phenicians, was built across the Hellespont. The bridge, however, was destroyed by a storm, on which (according to the Greek historians), Xerxes ordered the heads of the engineers to be cut off, and was so enraged at the rebellious and disrespectful sea, that he ordered 300 lashes to be administered to it, and a set of fetters to be cast into it. Another bridge, consisting of a double line of boats, was built; and a canal was cut through mount Athos, at the point of the peninsula of Acte in Macedonia, on which the fleet of Mardonius had been

wrecked in 492 B.C. The preparations were completed in 481 B.C., and in the autumn of that year, Xerxes arrived at Sardis, where he wintered. In the spring of the following year, the vast assemblage began to march toward the Hellespont; and, according to Herodotus, it took seven days and nights to march across the bridge. After crossing the Hellespont, the march was continued along the Thracian coast toward Doriscus on the Hebrus, where a halt was made on a large plain, and the army numbered. The fleet drew up near to Doriscus. According to Herodotus, the whole number of fighting-men, military and naval, amounted to nearly 2,500,000, and the fleet consisted of 1207 ships of war, besides 3,000 smaller vessels. These numbers were considerably increased during the march between Doriscus and Thermopylæ by the Thracians, Macedonians, Magnesians, and other nations through whose territories Xerxes passed on his way to Greece. Herodotus supposes that the number of camp-followers, exclusive of eunuchs and women, would amount to more than that of the fighting-men; so that, according to him, the whole number of people assembled on this occasion would be considerably over 6,000,000, a number greater than the entire population of Ireland. This number is doubtless greatly exaggerated; still, it cannot be doubted that this was one of the greatest multitudes ever brought together for any purpose under the sun. Grote, who discredits the immense numbers given by Herodotus, nevertheless says: "We may well believe that the numbers of Xerxes were greater than were ever assembled in ancient times, or perhaps at any known epoch of history." This immense force moved on without resistance through submissive nations till it reached Thermopylæ (q.v.), where it was brought to a stand by the army of Leonidas (q.v.). Although the Greeks were entirely defeated and slain, it was not without heavy loss to the Persians. On the same day, and on the third day after, the Persian fleet, which had previously suffered severely from a storm, was defeated with heavy loss by the Greeks off Cape Artemisium in Eubœa. Xerxes continued his march on to Athens through Phocis, which he laid waste, and Beotia, whose inhabitants joined him, with the exception of those of Platæa and Thespia, which cities he burned. A detachment which he sent to attack Delphi met with a signal defeat. When Xerxes arrived at Athens (in the summer of 480, three months after crossing the Hellespont), he found the city deserted, the Athenians having sent their families to Trœzen, Ægina, and Salamis. Athens was destroyed. Meantime the two fleets had sailed round from Eubœa and taken up their positions in the narrow strait between Salamis and the Attic coast, where the famous naval battle of Salamis took place (Sept., 480 B.C.). See SALAMIS. Xerxes witnessed the fight from a lofty throne which he had caused to be erected on one of the slopes of mount Ægaleus,

> "The rocky brow
> Which looks o'er sea-born Salamis."

Xerxes was apparently confounded at the unexpected and inglorious result of all his mighty preparations for the overwhelming of Greece, and, becoming alarmed for his personal safety, fled, under an escort of 60,000 men, with all haste toward the Hellespont, which he reached in 45 days. The bridge of boats having been again destroyed by a storm, he crossed over to the Asiatic coast in a vessel. Mardonius was left with 300,000 men to carry on operations in Greece. In 479 B.C., the Greeks defeated Mardonius in the famous battle of Platæa (q.v.), and on the same day gained another victory over the Persians at Mycale in Ionia. Next year (478 B.C.), the Persians lost their last possession in Europe by the capture of Sestos on the Hellespont. The war was continued for a few years longer, though the struggle was now virtually at an end. Little more is known of the personal history of Xerxes, except that, in 465 B.C., he was murdered by Artabanus, who aspired to the throne, and was succeeded by his son Artaxerxes. From all that is known of Xerxes, he appears to have been utterly ignoble in character, vain-glorious, licentious, cruel, cowardly—the very *beau-ideal*, in short, of the worst kind of eastern potentate. His history would be scarcely worth recording were it not for his connection with Greek history. His famous invasion was undertaken apparently for no other purpose than to gratify a weak-minded vanity, which was delighted with the idea of being able to assemble at one time "ships by thousands" and "men in nations," who were at the mercy of his unprincipled caprice.

XIME'NES DE QUESA'DA, GONZALO, about 1500–79; b. Spain; came to South America, was a judge in Santa Marta in 1635. Soon afterward he led an expedition against the Chibcha Indians, and at the head of 800 men, after great hardships, captured the cities of Iraca and Tunja in New Granada, found a large amount of treasure, and broke the power of the Chibchas. He founded the city of Bogota in 1538, visited Spain the next year, and received the title of marshal, and on his return to South America went in search of El Dorado. In 1572 he founded Santa Agueda.

XIMENES, FRANCIS DE CISNEROS, by which latter name he is commonly called in Spain, the well-known statesman, archbishop, and cardinal, was born of a humble family at Torrelaguna, in Castile, in 1436. He was educated at Alcalá de Henares, Salamanca, and finally Rome, where he obtained from the pope a provisional or prospective nomination to a prebend in the cathedral of Toledo. The archbishop, resisting the papal claim of "provisor," refused to admit Ximenes; and on his persisting in his claim,

put him in prison, where he was detained for a long period. On his release, he was named vicar-general of cardinal Mendoza at Siguença; but he gave up this preferment, and entered the Franciscan order in 1482. His reputation for piety and learning, led the queen, Isabella, to choose him, in 1492, for her confessor; and three years afterward, to name him archbishop of Toledo—a dignity which he refused to accept until he received an express command from the pope. Having yielded in the end, he continued as archbishop the life of mortification and austerity which he had practised in his monastery; and he applied to purposes of religion, charity, and public utility the whole of the princely revenues of his see. As confessor and confidential adviser of the queen, Ximenes, during the lifetime of Isabella, was the guiding spirit of Spanish affairs; and on her death in 1504 he held the balance between the parties of Ferdinand and Philip of Burgundy, husband of Joanna, the heiress of the crown. On the death of Philip in 1506, Ximenes was appointed regent, in consequence of the incapacity of Joanna and the absence of Ferdinand, and conducted the affairs of the kingdom through a most critical time with consummate skill and success. In 1507 he was created cardinal; and in the following year he organized, at his own expense, and himself accompanied as commander, the celebrated expedition, consisting of 10,000 foot and 4,000 horse, for the conquest of Oran, on the African coast. Ferdinand died in Jan., 1516, and on his deathbed named Ximenes regent of Spain till the arrival of his grandson Charles; and although the grandees had organized an opposition as well to himself as to the royal authority, Ximenes, by his prompt and able dispositions, overawed them into submission; and subsequently, by the same exercise of vigor and determination, quelled the incipient revolt of Navarre. In order to the better consolidation of the royal authority in Spain, Ximenes urged very strongly the speedy visit of Charles, who still lingered in his Flemish principality; but it was not till after the lapse of a year and a half that the king decided on his journey; and meanwhile the enemies of Ximenes had so worked upon his jealousy and pride, that he took the ungracious and ungrateful course of dismissing his faithful, but, as he feared, too powerful servant. Ximenes had set out to meet the king, and although laboring under great infirmities, continued to prosecute his journey, when he was seized with a mortal illness at Branguillas, near Aranda de Duero, where he died, Nov. 6, 1517.

As a statesman and administrator, the reputation of cardinal Ximenes is deservedly of the very highest. The social and political revolution which he effected in breaking down the feudal power of the nobles has often been compared with the analogous change wrought in France by Richelieu. But the revolution of Ximenes was, at least in its results, rather in the interest of the people than, like that of cardinal Richelieu, of the crown; and while it freed the sovereign from the unworthy position of dependence on the nobility, it established the municipalities and the communal representatives in the enjoyment of certain well-defined and undoubtedly substantial privileges and immunities. His munificence as a patron of religion, of letters, and of art, has been the theme of praise in every history of his time. The university of Alcalá de Henares, which he planned, organized, erected, and endowed, was a marvel of enlightened munificence in such an age, and may compare advantageously with even the most princely foundations of the most enlightened times. His Complutensian Polyglot (q.v.), besides being the first of its class, was, considering the resources of the period, perhaps the grandest in conception among the projects of its own order; and the perseverance with which, during the long period of fifteen years devoted to its preparation, he watched and directed its progress, is an evidence that it originated from a genuine love of sacred learning, rather than a passing impulse of literary enthusiasm. The cost of this gigantic undertaking amounted, on the whole, to 80,000 ducats. His expenditure on churches, hospitals, schools, convents, and other works of religion and benevolence, was on a scale of corresponding munificence. He maintained thirty poor persons daily at his own cost, and he regularly set apart one half of his income to the uses of charity.—See Hefele's *Der Cardinal Ximenes und die kirchlichen Zustände Spaniens* (Tübingen, 1851); Prescott's *Ferdinand and Isabella.*

XORULLO. See Jorullo.

XYLOGRAPHY. See Wood Engraving.

XYLOI'DIN is a substance which is precipitated in the form of a white powder, insoluble in water, alcohol, and ether, when water is freely added to a solution of starch in cold nitric acid. Its composition is not determined with positive certainty, but it is probably starch, $C_6H_{10}O_5$, in which either one or two atoms of hydrogen are replaced by a corresponding number of nitric acid radicals, NO_2. According to prof. Miller, there is a substitution of two atoms, so that the formula representing xyloidin is $C_{12}H_{18}(NO_2)_2O_{10}$. It explodes when sharply struck, and burns with violence at 356° F. (180° C.). By the action of reducing agents, it is again converted into starch.

XYLOL (Gr. *xylon*, wood) is an oily aromatic fluid with a strong refractive power, and boiling at about 284° F. (140° C.). Its composition is represented by the formula C_8H_{10}, and it is regarded as the hydride of a non-isolated radical, C_8H_9, to which the name *xylyl* is given. Xylol, mixed with toluol, cumol, and cymol, is found among the oils which are separated from coal-tar by fractional distillation.

XYLOPHAGA (Gr. wood-eaters), a family of *coleoptera*, of the section *tetramera*, nearly resembling weevils, but differing from them in the want of a beak. They have short antennæ, thickened toward the tips, and sometimes leafy from the base. The species are numerous, and are arranged in many genera. They mostly live in wood, on which they feed, both in their perfect and larval states. Some of them are very destructive to trees and timber. See BARK BEETLE and SCOLYTUS. Some of the xylophaga live in fungi and feed on them.

XYLOPHONE, a musical instrument composed of wooden keys arranged in the order of their notes upon a body of wood. It is played by two little mallets held in the musician's hands, the principle being the same as that of the musical glasses.

XYRIS. See YELLOW-EYED GRASS.

XYSYTHRUS, according to the Chaldæan historian Berosus, was king of Babylon at the time of the deluge. In the fragments of the history which have been preserved by Eusebius, it is said that many people of different tribes dwelt together on the plain of Shinar, without laws and in a barbarous manner; that a god appeared among them from the Persian gulf and taught them the arts of civilization; that thus Babylon was built and reigned over by 10 kings, the last of whom was Xysythrus; that he, warned of a coming deluge, built a ship in which he was saved; that when the waters retired the ship stranded on the mountains of Koordistan, and the king, going out of it, built an altar, offered sacrifices, and disappeared in the clouds. There is said to be a striking resemblance in many important features between this narrative of Berosus and that of Moses.

Y

Y, THE last letter but one of the English alphabet, is derived from the Greek γ (*v*). It had no place in the earlier Latin alphabet, and only came into use by Roman writers in the time of Cicero in spelling words borrowed from the Greek. In the Greek of the classical age, υ (γ) no longer retained its pristine power (Ital. *u* or Eng. *oo*), but had degenerated into a sound like the French *u*, or even nearer to *i* (*ee*); it could not therefore be represented by the Roman *u* or *v*, which had remained (and remains yet in modern Italian) undegenerated, and thus was appended to the Roman alphabet as a new character. Its use in native Latin words, as *sylva* for *silva*, *satyra* for *satira*, is an error of modern editors. Italian has no *y*, but uses *i* instead, as *sinfonia*, symphony. The other modern languages of Europe have not only retained it in spelling words of Greek origin, but some of them substitute it for *i* in native words, generally in a very capricious manner. German orthography has recently been purged of this abuse; and in Dutch, where it had always the sound of English *i* (*ai*), the double character *ij* is now written. In English it is used to represent the semi-consonantal power of *i* or *j* (see I and J) in the beginning of a word and before another vowel, as *yoke* = Lat. *iugum* or *jugum* = Ang.-Sax. *iuc.; young* = Ang.-Sax. *iong* = Ger. *jung*. It has been suggested that the practice of writing *y* at the end of a word instead of *i*, while we replace it by *i* on adding a syllable (e.g., *lovely, lovelier*), may have arisen like the habit of giving a tail to the last unit of the Roman numerals (e.g., ij, iiij), in the wish to give a kind of finish to the word and please the eye. The would-be antique spelling *yᵉ*, *yᵗ*, for *the, that*, is a blunder, arising from mistaking the Ang.-Sax. þ (= *th*) for a *y*.

YACHT is a small vessel constructed so as best to insure strength, elegance, and speed, and exclusively employed for pleasure-sailing. Vessels of this sort were first constructed in this country in 1604, at which date a yacht was built by the king's master-shipwright for Henry, eldest son of James I. of England; the idea of such a vessel being taken from the Dutch, among whom they had been employed for some time previous. From this time yachting, steadily patronized by royalty, became a favorite pastime of the nobility and gentry, and there are now about 50 yacht clubs in the United Kingdom, possessing, according to the *Yacht List* of 1880, 3,700 yachts. This amusement is encouraged by government, mainly because it supplies an excellent training for seamen, who in time of war become available for the royal navy, while in time of peace they are no burden on the national treasury; and accordingly yachts are allowed to bear the ensign of the royal navy, supplemented by the special flag granted by the admiralty to each club, and to refit and revictual in the royal dockyards. The oldest yacht club in the United Kingdom is the *Royal Cork*, which, under the title of the "Water club of Cork," is known to have existed as early as 1720; and the next in order of seniority is the *Royal Yacht Squadron*, founded in June, 1815, and having its headquarters at Cowes, isle of Wight. The club which stands first as to the number of its members and yachts is the *Royal Thames Yacht Club*, which was founded in 1823, and has its headquarters in London. Of the other clubs, 6 are Scotch (4 on the Clyde and 2 on the Forth), 8 Irish (2 at Queenstown, 2 at Kingstown, 1 at Dublin, 1 at Belfast, 1 at Carlingford loch, and 1 at loch Erne), and the rest English, being mostly located on the Thames, the channels between Southampton and the isle of Wight, or the n. coast of Wales, from Liverpool to

Holyhead. More than half of these clubs have been founded since 1840. Yachting is gaining ground in foreign countries and in the British possessions, the United States ranking next to Great Britain and Ireland in the number and importance of her yacht clubs (the chief of which is the New York yacht club); and Holland, Belgium, France, Australia, Bermuda, Canada, and Russia have similar associations.

The principles adopted in the construction of yachts have fluctuated greatly, from the simple unpretending rig, small tonnage, and clumsy build of the early yachts of the royal Cork club, to the immense canvas area, larger size, and long narrow build of the yacht of the present time. The yacht of the early part of the century was built with a fine run aft, and a bluff bow; but about 20 years ago this style was supplanted by increased sharpness of bows and stern, a raking (slanting upward and backward) stern-post, more depth, the draught aft double of that forward, great fineness of the water-lines, narrow beam, and immense sails. The effect of these changes was a great increase of speed, attended, however, with certain defects: one of which was that the diminished breadth of beam injuriously affected buoyancy, and the yachts consequently were more liable to be wetted in a heavy sea. In 1851 the hollow manner in which the crack yachts of the principal clubs in England were beaten by the yacht *America* of the New York yachting club, showed their owners and builders that they had still much to learn in the way of improvement; and, with few exceptions, they wisely took the lesson. The *America* had great breadth of beam, comparatively little depth inside, an upright stern-post, extremely sharp entrance, and fine water-lines, and (the most remarkable feature) her maximum breath considerably abaft the center. With the exception of the great breadth of beam, and little depth inside, all the other characteristic points of the American yacht were adopted by the builders of yachts in this country; the difference between the draught aft and forward was diminished; and the result of these changes has shown that they were great improvements.

The materials used in the building of yachts are wood, iron, and steel; wood alone, wood and iron together, iron alone, and steel alone, being the various ways in which the materials are employed. Yachts built of wood, or of wood and iron, are generally coppered, to protect the planking, and secure the smoothness of surface essential to speed. The considerations which determine the relative length, breadth, depth, etc., are treated of under SHIPBUILDING. Considerable stimulus is given to improvements in construction by the numerous prizes which are offered for competition by the various yacht clubs, and which amounted in 1875 to $70,000, besides cups. These small, but powerfully built and thoroughly sea-worthy vessels have traversed every sea on the globe; numbers make trips to Norway and the Mediterranean; some visit America and the Indian and Southern oceans; and one or two have circumnavigated the globe. Some of the most remarkable performances of yachts are the voyage from New York to Liverpool of the *Charter Oak*, 23 tons, in 36 days; that of the *Sylvie*, 205 tons, from Halifax to Havre, in 16½ days; those of the *Inca*, *Katinka*, and *Vivid*, 25 tons each, from England to Australia; and the great Atlantic yacht-race from New York to Cowes, in Dec., 1866, which was won by the *Henrietta*, 205 tons, after a voyage of 14 days. Yachts may be divided, according to the style of their rig, into cutters (q.v.), fore-and-aft and square topsail schooners (q.v.), and yawls (q.v.). The tonnage of these vessels is very variable, ranging from 3 to 420 tons in Britain, the average tonnage being 30 to 50 tons. Steam-yachts (screws) are now exceedingly common, their independence of wind making them very popular. The *Victoria and Albert* and the *Osborne*, both belonging to the queen, are specimens of this class.

The first regular club in the United States was founded in New York in 1844; in 1845 a club house was built on the Hudson near Hoboken; and in the same year the first regatta was held in New York bay. In 1846 the first race was contested between the sloop *Maria*, 154 tons, owned by John C. Stevens, the commodore of the club, and the schooner *Coquette*, 74 tons, owned by J. H. Perkins; the course being 25 m. to the windward and return, from the light-ship off Sandy Hook. The race was won by the *Coquette*. In 1851 the victory of the *America*, belonging to the New York yacht club, gave a great impetus to yachting in this country, and changed English views as to the scientific principles of ship building. (See the preceding article). In 1866 the *Henrietta*, *Fleetwing*, and *Vesta* raced from Sandy Hook to Cowes for a purse of $90,000. The *Henrietta* won in 13 days 21 hours and 55 minutes. In 1870 Mr. James Ashbury, a prominent English yachtsman, brought the *Cambria* to this country. In the voyage over she defeated Mr. James Gordon Bennett's *Dauntless* by one hour only. In the race for the queen's cup (brought here by the *America*) the *Cambria* was beaten by the sloop *Magic*, which won in 4 hours 7 minutes 54 seconds, actual time, the course being from Stapleton, Staten island, around the s.w. spit to the Sandy Hook light-ship and return, about 43 miles. In 1876 the Canadian yachtsmen sent the *Countess of Dufferin* to New York to contend for the queen's cup, but she also proved unsuccessful. There are now nearly 40 different clubs in this country. Among the largest, besides the New York club, may be mentioned the Brooklyn, the Eastern, and the Hudson River clubs. In 1880 the National yacht association held its first meeting in New York harbor. There were 40 yachts entered from 13 clubs. The winners in the different classes were the *Silence*, 3 h. 52 m. 37 sec.; the *Isonomy*, 4 h. 01 m. 16 sec.; the *G. B. Deane*, 4 h. 26 m.

02 sec.; and the *F. L. Sheppard*, 2 h. 52 m. 45 sec.; all actual sailing time. Racing yachts use a large triangular sail called a spinaker, which is set from the topmast head to the deck and boomed out on the windward side when the wind is abaft the beam By special acts of congress yachts are given the privilege of coming into and leaving ports without entering or clearing at the custom-house or paying tonnage tax.

A fair estimate of the speed of modern American yachts may be had by averaging the times made at the various regattas of any season. The following were among the contests of 1884, in the waters surrounding New York: Knickerbocker club, May 31st, from Port Norris to and around Ft. Schuyler buoy for the eighth class; for other classes around Gangway buoy, off Sands point; winners, class A, *Sara*, 4 h., 46 min., 01 sec. (elapsed time); class B, *Reckless*, 4 h., 58 min., 46 sec.; class C, *Gracie*, 4 h., 18 min., 43 sec.; class D, *Daisy*, 4 h., 44 min., 27 sec.; class E, *Nellie R.*, 4 h., 35 min., 54 sec.; class F, *Adele*, 4 h., 34 min., 46½ sec.; class G, *Rex*, 4 h., 50 min., 01 sec.; class H, *Foam*, 4 h., 41 min., 20 sec. Eclipse club, June 2d: from East 104th st. around Throgg's Neck, and return, 15 m.; winner, *Jessie*, 3 h., 31 min., 04 sec. Williamsburg club, June 3d: from club house on Pottery beach through Hell Gate to the Gangway buoy, returning to Hunt's dock; winners, class A, *Van Voorhis*, 4 h., 44 min., 42 sec.; class B, *Mary Keegan*, 5 h., 36 min., 30 sec.; class C, *Tidal Wave*, 6 h., 52 min., 05 sec.; class D, *A. J. Foster*, 6 h., 30 min., 21 sec. Atlantic club, June 10th: from Bay Ridge through the Narrows round the buoy on the s. w. spit, thence around the Scotland and Sandy Hook lightships, returning s. and w. of the Romer beacon; winners, class A, *Grayling*, 6 h., 16 min., 04 sec.; class B, *Triton*, 6 h, 40 min., 27 sec.: class C, *Mischief*, 6 h., 11 min., 10 sec.; class D, *Fanita*, 6 h., 26 min., 22 sec. (corrected times). New York club, Aug. 11, handicap race from Martha's Vineyard to Newport: winners; schooners, *Clio*, handicap corrected time, 4 h., 55 min., 41 sec., actual corrected time, 4 h., 48 min., 53 sec.; sloops, *Mischief*, actual handicap time, 5 h., 19 min., 16 sec.; actual corrected time, 5 h., 22 min., 45 sec.; *Vixen*, 5 h., 13 min., 53 sec.; and 5 h., 09 min., 07 sec.; and *Athlon*, 5 h., 04 min., 11 sec., and 5 h., 18 min., 05 sec. 1885, Aug. 5, during the annual cruise of the New York club, in a race from Newport to New Bedford—over 30 m.—the *Priscilla* made the run in 3 h., 05 min., 51 sec., and the *Gracie* (a smaller boat) in 3 h. 15 min., 05 sec., beating the *Puritan* (3 h., 17 min., 07 sec.) and the English yacht *Genesta*. A few days afterward, however, in a race of 38 m., the *Puritan* beat the *Priscilla* by 1 min., 52 sec., completing the course in 3 h., 51 min., 26 sec. In 1886, the *Mayflower* beat the English *Galatea* by 12 min., 8 sec.; and in 1887 the American yacht *Volunteer* beat the English *Thistle* by 19 min. 23¾ sec. In 1893, the Earl of Dunraven challenged the defenders of the cup with his 85 ft. cutter, *Valkyrie*. To meet him the 86 foot centre-board yacht *Vigilant*, built by Herreshoff, was selected. Two races, which took place in October, resulted in the *Vigilant's* favor,—the first being won by 5 m. 48 s. corrected time, and the second by only 40 seconds. In 1894, Mr. George Gould purchased the *Vigilant* from the syndicate that had built her, and took her to England, where she met with poor success against the Prince of Wales's cutter *Britannia*, with which she raced 16 times, winning only 5 of the contests.

Steam yachting has much increased of late. It has been proved by experiment that for the perfect working of steam yachts, in ocean voyages, the chief necessity is due protection against cylinder condensation. For this reason it is found advisable to use non-conducting material in the manufacture of the interior surfaces of cylinders. Under these conditions alone can high speed be attended with comparative economy. A brief description of some of the essential features of the fine English steam yacht *Lady Forfrida* (built by Elder & Co., 1883) will cover many of the improvements of late years in this branch of the art of shipbuilding. The engines have a steam pressure of 110 lbs. to the sq. in., with a vacuum of 28½ in. With this pressure, they are of 1,020 horse-power. There are two low-pressure inverted cylinders, and one high-pressure, also inverted—the former with a diameter of 24 in., and the latter with one of 34 in. The high-pressure cylinder (steam-jacketed, like the other two) differs from the low-pressure cylinders in the construction of its valve, which is like the equilibrium pistons, and not "slide." One of the low-pressure engines works the various pumps, while the other causes a reciprocating circulating pump to supply the surface condenser with water. The single-acting air-pump has a 17 in. stroke, and is 20 in. in diameter. The propeller is formed of solid manganese bronze. The American Yacht club was organized in New York, 1883, to encourage steam yachting; it now has a large membership. In 1885, June, the *Stiletto*, from the docks of the blind ship-builder Herreshof, Bristol, Penn., surprised yachtsmen by beating the *Mary Powell* (which had been known as "Queen of the Hudson") in a race of 29 m., performing the feat in 1 h., 17 min. In July of the same year, she won the regatta of the American Yacht Club, running from Larchmont through Long Island sound to New London, a distance of 92 m., in 4 h., 13 min. This boat is 95 ft. long, with a water-line length of 90 ft., and a beam width of 11 ft. The stern is nearly as narrow as the bow. The boiler is a beehive coil, with the fire directly under it, and never containing more than a gallon of water at a time, though having a capacity of 200 lbs. of steam. Steam-yachts are usually built of "mild" steel. As this metal rusts in some waters, however, it has been proposed to use "delta" metal (an alloy of iron, copper, and zinc) in their manufacture. A yacht was built of this metal for the African exploring co., 1884. See Kunhardt's *Small Yachts* (N. Y., 1885).

YADKIN, a co. in n.w. N. C., bounded on the n. and e. by the Yadkin river; about 320 sq.m.; pop. '90, 13,790. Iron is found. Co. seat, Yadkinville.

YAHOOS. See HOUHNYMNS.

YÂJNAVALKYA is the reputed author of the S'atapatha-Brâhman'a (See *Yajurveda,* under VEDA), and of a Dharmas'âstra, or law-book (see SANSKRIT LITERATURE, sec. *law*). His name points to his being a descendant of Yajnavalka, and, according to tradition, he was also a descendant of *V'iswámitra* (q.v.), and belonged to a branch of the *Kus'ikas.* He seems to have occupied an influential position at the court of king Janaka of Videha. Nothing certain, however, is as yet known regarding the age at which he lived.

YAK, *Bos grunniens,* a species of ox found in Thibet, and domesticated there. It is ranked by col. Hamilton Smith in the genus *bison,* along with the bison, gaur, and gayal, and by Mr. Gray in the new genus *poephagus.* The wild yak of central Asia is the largest native animal of Thibet, and is found only near the limits of perpetual snow, descending into the higher wooded valleys in winter, and ascending in summer to the pastures of short grass and *carices,* some of which are at an elevation of 17,000 ft. above the sea. It is hunted by large dogs, and is very fierce, falling upon an adversary not only with its horns but with its chest, and crushing him by its weight. It is generally black. The yak has been domesticated from time immemorial, and forms great part of the wealth of the inhabitants of the highest and coldest regions of central Asia. The domesticated yak is about the height of an English ox, which it much resembles also in figure of body, head, and legs. It is covered all over, however, with a thick coat of long silky hair, hanging down like the fleece of a sheep. The head is rather short; the eyes large and beautiful; the horns not very large, spreading, tapering from the base, a little turned back at the tips, a space between them on the forehead covered with a mass of curling hair; the nose is smooth and convex, the nostrils small. The neck is short; the withers high and arched; the rump is low; the legs are short. Over the shoulders there appears a bunch somewhat like that of the zebu, but it consists only of long hair. The hair of the whole ridge of the back is long and erect, but not harsh. The tail is covered with a prodigious quantity of long flowing hair, descending to the hock, and has much the appearance of a large bunch of hair artificially attached. Not a joint of it is visible. From the chest, between the fore-legs, issues a large pointed tuft of long hair. The hair of the shoulders, rump, and upper parts of the body, is comparatively thick and short; but that of the lower parts is long and straight, hanging below the knee, and sometimes even to the ground. Yaks exhibit great variety of colors; but black and white are the most prevalent. It is not uncommon to see the long hair on the ridge of the back, the tail, the tuft on the chest, and the legs below the knee white, while all the rest is jet black. The great quantity of hair, evidently a protection against the cold of the climate for which it is destined, gives the yak an apparent size far beyond the reality.

The yak does not low like an ox, but utters a short grunting sound like a pig, as the expression either of uneasiness or of satisfaction.

The milk of the yak is very rich, and the curd made of it is much used by the Thibetans, both fresh and dried, often powdered into a kind of meal. The butter made from yak-milk is excellent, and is preserved for a long time in the dry and cold climate of Thibet in bladders. It is an important article of Thibetan commerce. The flesh of the yak is of the finest quality; that of the calves is much superior to ordinary veal. Yak flesh is often dried in the sun by the Thibetans, and eaten raw. The yak is never used for tillage or draught, but is very much employed as a beast of burden, and travels at a slow pace 20 m. a day, where no other beast of burden could well be employed. The lazy and luxurious lamas of Thibet often ride upon it, an attendant leading the animal. The hair is spun into ropes, and made into coverings for tents. The soft fur on the hump and shoulders is made into a fine and strong cloth. Caps, jackets, cloaks, and blankets are made of the skin with the hair on. The tails are the *chowries,* or fly-flappers, used in all parts of India, and which are to be seen particularly on all occasions of state and parade, and sometimes in the hands of the meanest of grooms, sometimes of the highest officers of state. See illus., Ox, vol. XI.

YAKI'MA, a co. situated in s. Washington; about 5760 sq.m.; pop. '90, 4429. Co. seat, North Yakima.

YAKOOB BEY, d. Kashgar, 1877. By some accounts he was a native of Khokand, by others an Arab. Little is known of his history until he distinguished himself in the defense of Khokand against the Russians, 1853. Though finally defeated, he fought with great valor, and was given the title of Bey by the Khan of Khokand, who sent him to aid an insurrection against the Chinese in Kashgar, 1863. He succeeded in driving out the Chinese, and having himself proclaimed Ameer of Kashgar. He conquered several other cities of the Tarim basin; expelled the Chinese completely from east Turkistan, and formed a powerful dynasty, over which he ruled until 1877, when he died while in the midst of a campaign against the Chinese, who for some years had been preparing to recapture the country. After his death the Chinese reconquered his territory. The Turks had hoped that he would become a great Mussulman power, and he was allowed by the sultan Abdul Aziz to assume the honored title of Commander of the Faithful.

YAKSHA is, in later Hindu mythology, the name of a kind of demigods, who especially attend on Kuvera, the god of riches, and are employed in the care of his garden and treasures. According to the Vishn'u-Purân'a, they were produced by the god Brahman, as beings emaciate with hunger, of hideous aspect, and with long beards; but Brahmanic poetry generally represents them as inoffensive. The Buddhists, however, describe them in some of their legends as cruel demons, who feast on serpents and human corpses.

YAKUTSK. See JAKUTSK.

YALE, a town, the head of navigation on the Fraser river, in British Columbia, 103 miles from Vancouver. Near it are the gold-washings, across the river is the mining town of Hope Station. Chinese and Indians form a part of the population, which in 1891 numbered 1382.

YALE, ELIHU, the early patron of Yale college, from whom it received its name, was the son of Thomas Yale, who came to America in 1638 with the colonists who settled New Haven, but soon after removed to Boston, where Elihu was born, April 5, 1648. In 1658 the son accompanied his father to England, and never returned to America. After completing his education in England, he went to the East Indies, where he resided for about twenty years, and acquired a great estate. From 1687–92 he was governor of Fort St. George, Madras, and after his return to London was governor of the East India Company. He was also a fellow of the Royal society. His gifts in money and books to the college in New Haven, between 1714 and 1721, amounted to about £400. He died at London, July 8, 1721, and was buried in the churchyard at Wrexham, Wales. His epitaph contains the following lines :

> Born in America, in Europe bred.
> In Africa travel'd, and in Asia wed,
> Where long he liv'd and thriv'd ; at London dead.
> Much Good, some Ill he did : so hope all's even,
> And that his soul thro' Mercy's gone to Heaven.

YALE UNIVERSITY, at New Haven, Conn., is one of the oldest and best endowed universities in the United States.

The plans of the first settlers of New Haven in 1638, included the establishment of a college, but Massachusetts objected because there was not then population enough in the colonies to support the college already founded at Cambridge, and for sixty years the people of Connecticut sent their sons to Harvard. In 1700 ten of the principal ministers of the colony, all but one of whom were graduates of Harvard, at a meeting at Branford, formally founded a college by a gift of books for a library, and the next year the Colonial Assembly granted a charter making the ten ministers and their successors trustees of the "collegiate school of Connecticut." The trustees elected Abraham Pierson, of Killingworth, one of their own number, rector of the school, and, in order to insure the support of the towns on the river, voted to locate it at Saybrook, "as the most convenient place for the present." Until the death of Rector Pierson, however, the students and the one tutor lived at Killingworth, probably in the house of the rector. Under the second rector, Samuel Andrew, the senior class was instructed by him at Milford, and the other classes by two tutors at Saybrook. In 1717, amid much opposition, the school was removed to New Haven, and located permanently there. A wooden building was erected, where Osborn Hall now stands, which at commencement in 1718 was formally opened, when the name of Yale College was adopted, in honor of Gov. Elihu Yale, who had aided the institution by generous contributions. This building, besides chambers for students, and a library, was furnished with a kitchen and dining-hall, and from this time, for more than one hundred and twenty years, all students were required to board together in commons. Timothy Cutler was rector from 1719 to 1722, when, on account of a change in his religious views, he was excused by the trustees from further service. Elisha Williams served from 1726 to 1739, and was succeeded by Thomas Clap, who had more business qualifications than any of his predecessors. He drew up and published in Latin the first code of laws, catalogued the library, and drafted a new charter which was approved by the General Assembly in 1745, by which the former trustees were incorporated under the name of The President and Fellows of Yale College in New Haven. He erected Connecticut Hall (South Middle), then, "the best building in the colony," and a chapel (the Atheneum). President Clap also successfully defended the college against the attempted interference of the legislature in its management. Naphtali Dagget, Professor of Divinity, served as president from 1766 till 1777, when he was followed by Ezra Stiles. About this time, on account of the scarcity of provisions at New Haven, caused by the revolutionary war, the students were removed into the interior, the freshmen to Farmington, the sophomores and juniors to Glastonbury, and the seniors to Wethersfield. President Stiles succeeded in overcoming the opposition to the college which had long existed in the legislature, and in 1792, by joint action of the legislature and corporation, certain state funds valued at $30,000 were applied to the improvement of the college, and the Governor, Lieutenant Governor, and six senior senators became members of the corporation. The administration of Timothy

Dwight (1795–1817), begins a new era in the history of the college. At his accession there were about one hundred students, and the instructors consisted of the president, one professor, and three tutors, one tutor instructing each of the three lower classes in all of its studies. He established permanent professorships, and filled them with recent graduates of unusual ability and promise. Three young men, appointed at this time served the college together for more than half a century, and brought it great honor, Jeremiah Day in mathematics, Benjamin Silliman in chemistry, and James L. Kingsley in language. President Dwight, anticipating the growth of the college, extended, by purchase, the college green so as to include the whole front of the present campus, and continued the brick row to Berkeley Hall (North Middle). He also planned the organization of professional schools under district faculties, but the medical school only was established before his death. Jeremiah Day, who became President in 1817, had been selected by Dr. Dwight as his successor, and continued to carry out his plans. The divinity and law schools were organized and the brick row completed. Under President Day the responsibility for the government of the students was placed upon the faculty, and out of the stricter discipline now enforced, grew two unsuccessful rebellions known as the "Conic Sections Rebellion" and the "Bread and Butter Rebellion." In 1831 a fund of $100,000 was raised to meet the general expenses of the college, the total productive funds before this time having been less than $20,000. When President Day resigned in 1846, there were 587 students in the college, about one fifth of whom were from the southern states. Under President Theodore D. Woolsey (1846–1872), the corps of instructors was greatly enlarged, and the standard of scholarship raised; the scientific school was established, and the foundation laid for the school for graduate instruction; the professional schools were reorganized, and the school of the fine arts founded. During his twenty-five years of service the number of students increased to 809. Dr. Woolsey proposed the plan by which six graduates of the college took the place of the state senators in the corporation in 1871. In the same year Noah Porter became President. His administration was one of great material prosperity. At this time a most important change was made in the course of instruction, and the present system of elective studies was adopted. At his resignation the student body numbered 1079. He was succeeded in 1886 by Timothy Dwight, grandson of the elder President Dwight, under whose management the growth of the institution has been unprecedented. In five years the number of students increased more than fifty per cent. The name Yale University was authorized by the legislature in January, 1887. Under the last three Presidents the productive funds have been greatly augmented, and more than twenty buildings have been erected at a cost of above $2,000,000.

The Corporation as now constituted is composed of the President and eighteen Fellows, viz.: Ten Congregational clergymen, the successors of the ten original founders who by the charter of 1701 were made trustees of the "collegiate school," the Governor and Lieutenant-Governor of Connecticut, who were made members *ex-officio* in 1792, and six representatives elected by the graduates from their own number, one every year for a term of six years. The corporation, only, has power to confer degrees. The University includes four departments each under the administration of a distinct faculty.

In the department of philosophy and the arts are included the two undergraduate departments, the art school, and the school for graduate instruction. The academical department is the original college, and has existed since 1701. The course of instruction covers four years, and leads to the degree of bachelor of arts. During the first two years the following studies are prescribed: Greek, Latin, mathematics, German, French, and English. The work in junior and senior years is mostly elective. The charitable funds of the college yield an income of over $18,000, which is applied to the abatement of tuition of students of good character and standing who need aid. There are several scholarships and fellowships, yielding annually from $60 to $800 each, given to undergraduates and graduates of this department. Of the prizes to be won by competition, the chief are the De Forest, Townsend, Ten Eyck, and Betts prizes in English. The Winthrop, Robinson, Woolsey, Hurlbut, Berkeley, and Chamberlain prizes for excellence in classical scholarship, and the De Forest mathematical prizes. The college campus borders on the New Haven green, and occupies half of one of the original nine squares in which the city was laid out. It is bounded by College, Chapel, High, and Elm streets. The modern buildings are arranged so as to form a quadrangle 850 feet long and 400 feet wide. At the north corner of the campus is Alumni hall (1853), used for meetings of the graduates and examinations, at the west, the art school (1866), at the east, Battell chapel (1875), and at the south, Osborn Hall (1889), containing recitation and lecture rooms. On the High street side are situated the old library (1844), Dwight hall (1886), devoted to the uses of the Yale Y. M. C. A., and the Chittenden library (1890). The space on Elm and College streets is filled by the dormitories Durfee (1871), Farnam (1870), Lawrence (1886), and Welch (1892) halls. On the Chapel street side are Vanderbilt hall, the Art School and Osborn hall. The Sloane physical laboratory (1883) and the Kent chemical laboratory (1887) are west of the campus, on Library street.—The Sheffield scientific school furnishes both graduate and undergraduate instruction, but the larger part of its students are undergraduates. It was established in 1847 as a school of applied chemistry, and began with two professors and eight students in the president's house, where Farnam hall now stands. The degree of bachelor of philosophy was first given in 1852. Two years later, having enlarged its field, it was called the Yale scientific school. Mr.

Joseph E. Sheffield, in 1860, provided it with a building and a permanent fund, and the next year the school was reorganized and called the Sheffield scientific school. In 1863 it received from the legislature of Connecticut $135,000, being the proceeds of the congressional land grant of July, 1862, for the promotion of "such branches of learning as are related to agriculture and the mechanic arts." The school is under the control of a governing board, consisting of the president, the director of the school, and its permanent officers. Professor George J. Brush has been director since 1872. The course of study occupies three years. The work of freshman year is prescribed, including German, English, mathematics, physics, chemistry, and drawing. The instruction of the last two years is arranged in the following special courses: Chemistry, civil engineering, mechanical engineering, agriculture, natural history, biology, mining and metallurgy, and select studies. There are about seventy state scholarships open to students from Connecticut who expect to engage in agriculture, manufacturing, or engineering. The Sheffield campus borders on Hillhouse avenue, Grove, and Prospect streets, and contains Sheffield hall (1860), North Sheffield hall (1870), and the Sheffield biological laboratory (1889). The campus and buildings were all presented by Mr. Sheffield, whose gifts to the school have amounted to not less than $1,000,000.—The school of the fine arts was established in 1864. It is open to students of both sexes, and furnishes instruction in drawing, painting, sculpture, architecture, and copper-plate etching. Its collections include the "Jarves gallery of Italian art," the "Ehrich gallery of Dutch and Flemish art," and the "Trumbull gallery" of historical paintings, besides many casts, marbles, porcelains, bronzes, and wood-carvings.—The graduate department is under the direction of the philosophical faculty, which comprises the faculties of the three departments already described. It provides advanced instruction in studies not professional for graduates of colleges or universities. The number of courses offered in the graduate department of the university in 1896–7 was as follows: philosophy, etc., 25; political science and history, 44; oriental languages, 42; classical philology, 47; modern languages, 40; natural sciences, 54; pure and applied mathematics, 27; fine arts, 4; music, 7; and physical education, 1; total, 291. At the commencement in 1896, degrees were given to 30 doctors of philosophy, 11 masters of arts, and 4 civil engineers.

Each professional school forms a separate department of the university. The divinity school is north of the college campus, on the corner of College and Elm streets. East Divinity hall (1870) and West Divinity hall (1874) together accommodate about 150 students. The school was organized in 1822, but instruction in theology had been given at Yale since its foundation, and the first professor in the college was a professor of Divinity, in 1755. The school is Congregational in doctrine, but it has ever been characterized by a liberal spirit, and students of nearly every denomination avail themselves of its advantages. It possesses a very complete reference library and a valuable library of church music which formerly belonged to Dr. Lowell Mason.—The earliest professional school organized at Yale was the medical school. Four professors in medicine were appointed in 1813, and degrees were given the following year. The school was aided in the beginning by a grant of $30,000 from the state, and for seventy years was under the joint control of the college and the state medical society. It is closely connected with the New Haven hospital and the New Haven dispensary, which furnish good opportunities for instruction in surgery and the treatment of disease. The school building, at 150 York street, was erected in 1859.—The law school became a part of the college in 1824, though no degrees were given till 1843. It is located at present in the county court-house, but a new building for this department is soon to be provided. Its course of instruction is designed to fit for the practice of law in any state. An examination for admission is required of those who have not received a collegiate education. The law library is one of the most complete in the country. Three years of study are required for the degrees of bachelor of divinity and doctor of medicine, and two for the degree of bachelor of laws, but each school offers opportunity for one or two years of advanced work.

The university library contained (1896) about 200,000 volumes, and the Linonian and Brothers library about 20,000, all of which are accessible to students in any department. The additions to both libraries amount to about 6000 volumes annually. The Peabody museum of natural history was founded in 1866 by a gift of $150,000 from George Peabody, the London banker, and in 1876 the first wing of the museum, on the corner of High and Elm streets, was completed. It contains the collections in mineralogy, geology, paleontology, and zoology, with several laboratories and work-rooms. The buildings of the observatory are located on Prospect street, about a mile from the college campus. The late professor Elias Loomis bequeathed to the observatory a fund of more than $300,000, the income of which is to be used for the promotion of astronomical observations. The new gymnasium, completed in 1891 at a cost of more than $200,000, stands on Elm street, nearly opposite Peabody museum. The faculty and instructors in the university now (1897) number 238, and the students 2495, viz.: undergraduates, 1790 (academic, 1237; scientific, 553); art students, 53; music, 76; graduates, 281; students in theology, 104; medicine, 138; law, 213.

YALOBUSHA, a co. in n. Mississippi; about 472 sq. m.; pop. '90, 16,629. Co. seat, Coffeeville.

YAM, *Dioscorea*, a genus of plants of the natural order *dioscoreaceæ*, distinguished by an inferior ovary and membranous winged fruit. The species are mostly tropical,

natives of the East and West Indies, etc. They have tuberous roots and herbaceous twining stems. The great fleshy roots of some of them are very much used as an article of food, in the same way that potatoes are in more temperate climates. They contain much starch, and generally become somewhat mealy and pleasant to the taste when boiled. This, however, is not the case with all; the roots of *D. triphylla*, *D. dæmonum*, *D. virosa*, and several other species with ternate leaves are very nauseous even when boiled, and are poisonous. The tubers of all the yams contain an acrid substance, which, however, is dissipated by boiling, except in the species with compound leaves. The WINGED YAM (*D. alata*) is an article of food in daily use in the South Sea islands. The roots are 1½ to 3 ft. long, and often 30 lbs. in weight, with a brownish or black skin, juicy and reddish within. They vary exceedingly in form. The stem, which is winged, twines up tall poles which are provided for it by the cultivator; the leaves are between heart-shaped and arrow-shaped. Two or three small tubers are generally found in the axils of the leaves. It is supposed that this species may be the original of most, or perhaps all, of the yams cultivated in the tropical parts of Asia, Africa, and America—as the common yam of the West Indies (*D. sativa*), which has a round stem and heart-shaped leaves; *D. bulbifera*, in which the tubers in the axils of the leaves attain the size of apples; the prickly yam (*D. aculeata*), which has a prickly stem, and a fasciculated, tuberous root; *D. globosa*, the most esteemed yam of India, which has very fragrant flowers, and roots white internally; *D. rubella*, another Indian kind, with tubers sometimes 3 ft. long, tinged with red below the skin; etc.

YAMA, the Hindu god, who, at the epic and Purân'ic period of Hinduism (see INDIA, sec. *religion*), is the sovereign of the manes, and the judge of the dead, is, in the hymns of the R'igveda, a son of *Vivas'wat* and *Saran'yû*, and a twin-brother of *Yamî*, whose desire to become his wife he resists. His father is sometimes also called the *Gandharva*; and he is further represented there as possessing two four-eyed dogs, which guard the road to his abode (see J. Muir, "Yama and the Doctrine of a Future Life, according to the R'ig-, Yajur-, and Atharva-vedas," in the *Journal of the Royal Asiatic Society*, New Series, 1865, vol. i. p. 287, *ff.*). The idea represented by these mysterious deities has been differently understood. Prof. Roth takes Vivas'wat for the light of heaven, Saran'yû for the dark storming cloud, and Yama and Yamî as representing the first human pair—the originators of the race, or the Vedic Adam and Eve produced by the union of the damp vapor of the cloud and the heavenly light. The Vedic hymns, however, do not afford the slightest ground for such a fantastical interpretation of these names; and as regards that of Yama and Yamî, they discountenance it even distinctly by describing Yama as resisting the sexual alliance with his sister. Prof. Max Müller understands *Vivas'wat* to represent the sky; *Saran'yû*, the dawn; *Yama*, the day; and *Yamî*, the night (*Lectures on the Science of Language*, 2d Series, Lond. 1864, p. 509, *ff.*). But this interpretation, too, is open to the strongest doubts, inasmuch as there is no valid ground for identifying the luminous deity Vivas'wat with the sky, or *Saran'yû* (from *saran'a*, going, moving) with the dawn. It seems more probable that the phenomena symbolized by this myth are not of a luminous, but of an aerial character; the kindred myth of a luminous character being that of the *As'wins*, who are likewise the twin progeny of Vivas'wat and Saran'yû, or rather of Vivas'wat and "a form similar to that of Saran'yû," and who represent the transition from darkness to light, and the inseparable duality produced by the intermingling of both (see J. Muir, "Contributions to a Knowledge of the Vedic Theogony and Mythology, No. 2," in the *Journal of the Royal Asiatic Society*, vol. ii. 1866). For as *Vivas'wat*, "the expanding," probably implies the firmament "expanding" to the sight through the approaching light, *Gandharva*, as usual, the solar fire, and *Saran'yû*, the dark and cool "air" (the moving element), Yama and *Yamî* seem to represent the current of air produced by the effect of the solar heat emanating from the firmament on the cool air of the night, when the antagonism between the warm and cold air of which this current consists would be Yama repelling the union with his sister Yamî, though, at the same time, they are "husband and wife while yet in the womb" (of the night-air). And since this phenomenon extends over the whole atmosphere, the two four-eyed watch-dogs of Yama are probably the eight or twice-four regions of the compass, either each couple of them taken together with their intermediate regions—whence both dogs are called spotted—or the four regions and the intermediate four taken separately—whence one dog is also called *dark*, and the other *spotted*. Yama being produced by the solar heat, it becomes then intelligible why it is said of Agni, the (solar) fire, that he is born as Yama, and Yama being a phenomenon of the air, why he is also identified with Vâyu, the wind, and why the intermediate space between heaven and earth is assigned to him as his domicile. It is probably a later conception of the Vedic period which describes this abode as having been made for him by the spirits or *manes*, and Yama as having been the first who found his way to it; and a still later one, which represents him as the first of *mortals* who went to that world, for in passages where these ideas are expressed, there is an association between the moving air and departed life which is foreign to the oldest notions of the Vedas. It led to the position which subsequently Yama assumed as a luminous king who dwells together with the manes, and as the lord of death—death then becoming his messenger. Yet in the R'igveda, he has not yet the office of judge of the dead which is assigned to him in the later mythology

of the epic poems and Purân'as, and probably already in some of the Upanishads. At the epic and Purân'ic period, Yama entirely loses his cosmical character, though he is still called the son of Vivas'wat. He then marries 13 daughters of the patriarch Daksha, is installed as the king of the manes, becomes the regent of the south, and resides in Yamapura, a town of the infernal regions, where he sits in judgment over the souls of the departed which are brought before him. They are generally fetched by his messengers, who draw them with nooses out of the bodies which they animated; but in the case of very pious persons he assumes himself the function of separating the soul from the body. After the soul has been brought before him he orders his recorder, *Chitragupta* or *Chandragupta*, to read to him an account of all the good and bad actions it had done during its life, and which are kept registered in a book called *Agrasandhânî;* and according to their merit or demerit, it is sent to heaven or the infernal regions. The precise knowledge which the Purân'as pretend to possess of all these proceedings also extends to the description they give of this recorder, and to their enumeration of the assessors who co-operate with Yama at his court.—Yama's sister is *Yamunâ* (q.v.). Among his other names, *Dharma* ("justice"), *Dharmarâja* ("king of justice"), *Antaka* ("the ender"), *Kâla* ("time"), and *S'râddhadeva* ("the god of the S'râddha," q.v.), are of usual occurrence.

YAMASKA, a co. in central Quebec, Canada, bounded on the n.w. by lake St. Peter and the St. Lawrence river; about 250 sq.m.; pop. '91, 16,058. Capital, St. François du Lac.

YAMBU, or YEMBO (*Iambia* of Ptolemy), a maritime t. of Arabia, on the coast of the Red sea, about 130 m. s.w. of Medina; stands on the edge of a barren plain that extends between the mountains and the sea, fronting the northern extremity of a narrow winding creek. It shares with other places the title of "Gate of the Holy City," and is the third quarter of the caravan road from Cairo to Mecca, and is thus a place of considerable importance. Yambu being the port of Medina, is supported by a considerable transport trade and extensive imports from the western coasts of the Red sea. The harbor is good and well sheltered. It is surrounded by walls with turrets, outside of which are a few domes and tombs. The streets are wide, the houses stand at a considerable distance from each other, are built of limestone and coralline, and have huge hanging windows. There is a large market-place, a custom-house, some white-washed mosques of a very simple form, and a few caravanserais. According to Burton, "there is an independent bearing about the people, strange in the east; they are proud without insolence, and look manly without blustering. Moreover, the population has a healthy appearance." Pop. between 6,000 and 7,000. See Burton's *Pilgrimage to El-Medinah and Meccah* (1855).

YAMHILL, a co. in n.w. Oregon, bordering on the Coast Range mountains; 640 sq. m.; pop. '90, 10,692. Co. seat, McMinnville.

YAMUNÂ, the modern Jumna, is one of the sacred rivers of the Hindus, mentioned as such as early as in the hymns of the *R'igveda*. Bathing in it, especially where it falls into the Ganges, at Allahabad, was at a later period, and is now, supposed to have the efficacy of removing sin, because at Allahabad the god Brahman is said to have performed a great horse-sacrifice—whence this place is termed *Prayâga*, literally "sacrifice," or *Bhat't'aprayâga*, literally "the best sacrifice." (Though Allahabad, which is a celebrated place of pilgrimage, is *the* Prayâga, this term is also applied to other places where two sacred rivers meet, four of which, situated at the confluence of the Ganges with the Alakanandâ, Pindar, Mandâkinî, and Bhâgîrathî, are, besides Allahabad, held in especial sanctity, and severally called *Nanda-*, *Karn'a-*, *Rudra-*, and *Dera-Prayâga*.) In the Purân'ic mythology, the Yamunâ—in Sanskrit, a word in the feminine gender—is called a sister of the god *Yama* (q.v.); and a legend is also told in regard to her, according to which Balarâma, the brother of Kr'ishn'a (see VISHN'U, the 8th Avatâra), once ordered the river to come to him, and as she disobeyed his bidding, plunged his ploughshare into her banks, and dragged her to him. Yamunâ, the legend continues, was thus compelled to quit her ordinary course, and to follow Balarâma whithersoever he went. At last, however, appeased by her entreaties, he let her go, after she had watered all the country. Prof. Wilson appends to this legend, where occurring in his translation of the *Vishn'u Purân'a*, the following remark: "The legend probably alludes to the construction of canals from the Jumna, for the purposes of irrigation; and the works of the Mohammedans in this way, which are well known, were no doubt preceded by similar canals dug by order of the Hindu princes."—*Vishn'u-Purân'a* (Lond. 1840, p. 572).

YANCEY, a co. in n.w. North Carolina, bordering on Tennessee; about 298 sq.m.; pop. '90, 9490, chiefly of American birth. Mount Mitchell, in the s.e. part, is 6500 ft. high. Co. seat, Burnsville.

YANCEY, WILLIAM LOWNDES, 1814–63; b. Georgia; son of Benj. C. of S. C., educated at the north; studied law, and was admitted to the South Carolina bar. In 1836 he settled in Alabama, was a newspaper editor and politician, and in 1844 was elected to congress. He was an extreme democrat, and one of the foremost advocates of secession. In 1859 he favored the election of Breckenridge. In 1861 he introduced the ordi-

nance of secession into the Alabama legislature. During the war he was a member of the confederate congress, and an agent of the government in Europe.

YANG-TZE-KIANG, "son of the great river" or "sea," the principal river of Asia, the "girdle of China," connecting together all the central provinces of that empire, situated between Tibet and Kokonor on the w. and the Pacific ocean on the east. Its entire length through all its numerous windings, under various names, has been estimated at 3200 miles. If regard be had to its tributaries and to the cities to which its waters give access, to the richness of the soil, and the variety of the products along its banks, and above all to the vast population scattered far and wide over the valleys, and plains, and hill-sides drained by it and its confluents, the Yang-tze-kiang has no equal on the globe. It takes its rise in the same elevated regions of central Asia which give birth to the Brahmaputra, Makiang or Mekong, Salween, and Hwang-ho or Yellow river. Its course at first is southward, winding its way through an apparently level country, and bearing the name *Mura Ussu*, or Tortuous Waters. The magnitude of the stream must be considerable even in these upper regions, for it was here, beyond the Bayen Khara mountains, that the missionary traveler, M. Huc, in the winter of 1845, saw a herd of wild oxen that had perished, having got frozen up in the ice while attempting to cross the river. Leaving these upper regions, after traversing the wide territory of Kokonor, the Tortuous Waters run southward, and enter the province of Yun-nan at about 28° n. lat. The river then flows in a south-east direction through this province, and at about 26° n. lat. and 103° e. long., it turns north, forming part of the boundary between the provinces of Yun-nan and Sze-chuen. After entering the latter province, it flows in a n.e. direction under the name of *Kin-sha-kiang* (river of golden sands), receiving at this part of its course many tributaries. On the s., the tributaries of the provinces of Yun-nan and Kwei-chow are numerous, but not large; the principal one, the Oo or Woo, flows through the latter. On the n., the tributaries are numerous and large, the principal being the Ya-loong, the Min or Wen, and the Kia-ling, which force their way through narrow passes, rolling over lofty precipices, and carrying with them large masses of ice. Two of these rivers are each more than 1000 m. in length. It enters the province of Hu-pe at about 110° e. long., shortly before which it receives the name of *Ta-kiang* (Great river). The Great river next runs east-by-north through the entire length of the province of Hu-pe, receiving in its progress the waters of many lakes and rivers, the principal being the *Han-kiang*, from which the most illustrious dynasty takes its name, which in turn gave to Chinamen the name of which they are most proud —sons of Han. The two provinces Hu-pe and Hu-nan—i.e., "north of the lakes" and "south of the lakes"—contribute, by natural or artificial channels, to augment the main stream. One of these lakes, the Tung-ting-hu, is the largest in China, having an area of 300 sq. miles. After receiving the waters of these lakes, the river proceeds in a north-eastern course through the province of Ngan-hwui, in which part are situated the cities forming the great mart Han-kow. Skirting the n. of the province of Keang-se, it receives the waters of the Po-yang lake, which receives nearly the whole of the waters of the province of Keang-se, and, like the Tung-ting-hu, pours all its contents into the Great river. Thence moving in a n.e. direction, it becomes broader and deeper as it traverses the province of Ngan-hwui, receiving tributaries from both banks. Entering Keang-su, and passing Nankin, it travels southward, intersecting the "Transport river," or Yun-ho—i.e., the Grand canal. Through the whole of this province it receives tributaries, helping to swell the flood of waters, till in one broad expanse, several miles in extent from n. to s., they disembogue into the Yellow sea. To name the cities on the banks and tributaries of this rival of the Mississippi, would be to enumerate a large portion of the cities of the empire. It is navigable by ships of the largest class to 900 m. from its mouth, and for smaller vessels to upward of 1500 miles. There is a large steam traffic on it up to Han-kow, nearly 700 m. from its mouth. By the treaty of Tien-tsin, the Y. was opened to foreign commerce as far as Han-kow; and in 1877, Ichang, 360 m. further up the river than Han-kow, became an open treaty port and the seat of a British consul.

YANINA. See JANINA.

YANKEE. Yankee has long been the popular name given to a New Englander in America, and in Great Britain often applied indiscriminately to the whole population of the United States, was in its origin a corruption of the word English as pronounced by the Indians (Yenghies, Yanghies, Yankees). It seems to have been first applied about 1775 by the British soldiers as a term of reproach to the New Englanders, who themselves afterward adopted it.—Since the war of secession, the southern population apply it to the northern people generally.

YANKEE DOODLE, a national air of the U. S., the origin of which is unknown. The words, which were in derision of the ill-assorted provincial troops, are said to have been written in 1755 by Dr. Schuckbrugh, who served as surgeon under Gen. Amherst during the French and Indian war. The original title was *The Yankee's Return from Camp*, and several versions are extant. The tune, always called *Yankee Doodle*, passed through various changes. Its historical association has prevented criticism of the melody, which is shallow and shrill. It has been ascribed to various countries, but is probably of English birth. It occurs in Samuel Arnold's opera of *Two to One* (London, 1784), under the

name of *Yankee Doodle*. See Grove's *Dictionary of Music* and Helen K. Johnson's *Our Familiar Songs* (New York, 1881).

YANKTON, a co. in e. S. Dakota, separated from Nebraska by the Missouri river; about 515 sq. m.; pop. '90, 10,444. Co. seat, Yankton.

YANKTON, city and co. seat of Yankton co., S. Dakota; on the Missouri river and the Chicago and Northwestern, the Chicago, Milwaukee and St. Paul, and the Great Northern railroads; 61 m. n.w. of Sioux City, Ia. It is the seat of Yankton college (Cong.), and of the state hospital for the insane, and has a high school, electric lights, waterworks supplied from the river and artesian wells, national, state, and savings banks, and daily, weekly, and monthly periodicals. There are extensive Portland cement works, several flour mills, and breweries, woolen mill, planing mills, foundry, and pork-packing house. The city is the supply depot of the military posts and Indian agencies on the upper Missouri river, and has a large general trade. Pop. '90, 3670.

YAPOCK, *Cheironectes palmatus*, a marsupial quadruped of the opossum family, *didelphidæ*, the only known species of its genus. It differs from the opossums in having only five molars on each side of each jaw, in its aquatic habits, and its incapacity for climbing trees. The muzzle is rather sharp; the ears naked and rounded; the tail long, scaly, and prehensile; the feet webbed; the hind-feet with an opposable thumb. The Yapock inhabits Brazil and Guiana. It is rather larger than a rat. It is of a brown color, with three transverse gray bands, white on the under parts. It feeds on crustaceans, fishes, etc. It has cheek-pouches, in which it stows away its food.

YAQUIS, or HIAQUIS, a tribe of Mexican Indians, living on the Yaqui river, and kin to the Pima tribes. From 1735 to 1841 they were constantly in revolt against the Spanish and Mexican government, and showed great courage and skill in warfare. They are better advanced in civilization than most Indian tribes, and are industrious and well behaved. Stock-breeding is their chief pursuit, with farming and mining.

YAR, or YARE, a river of the county of Norfolk, rises about the middle of the county, flows e. past Norwich, and, receiving the Waveney, widens into the estuary of Breydon Water, is joined by the river Bure at Great Yarmouth, 2½ m. below which it enters the North sea, after a course of about 30 miles.

YARD (A.-S. *geard*, *gyrd*, Ger. *gerte*, a rod or wand), the British standard measure of linear dimension (see WEIGHTS AND MEASURES), is subdivided into feet and inches. The yard contains 3 ft., and each foot 12 inches. The term "yard" and "ell" (the ell being, however, equivalent to 1¼ yards) are frequently (*commonly*, according to Recorde) used synonymously by old authors.

YARD, in the rigging of a ship, is a timber which, when in its normal position, is borne horizontally at right angles to the ship's length at one of several heights on a mast, for the purpose of sustaining and spreading a square sail. It is upheld by the "lifts," and trimmed out of its right angle to suit the wind by the "braces." The lower sails or courses are upheld by the main, fore, or mizzen yards. Above these are the topsail-yards, the topgallant-sail-yards, and the royal-yards.

YARKAND, a city of eastern Turkistan (pop. 35,000–60,000), is situated in 38° 25′ n. lat., and 77° 15′ e. long., near a river of the same name. Until Yarkand was visited by Mr. Shaw, in 1868, we had little reliable information concerning it. He found it to contain long streets, covered in against the rays of the sun, with rows of fine shops, in which goods of every sort, and from every country, were exhibited. He found the bread excellent; the supply of vegetables varied and abundant; the butchers' shops well provided with horse-flesh, camel beef, and mutton. The population seemed industrious, orderly, and well skilled in many of the arts of civilized life. In 1877, eastern Turkistan (q.v.) was retaken by the Chinese, and Chinese rule was re-established at Yarkand. —See Shaw's *High Tartary, Yarkand, and Cashgar* (1871); Boulger's *Life of Yakoob Beg* (1878).

YARMOUTH, a co. in s.w. Nova Scotia, bordering on the Atlantic ocean; 736 sq. m.; pop. '91, 22,216, a third of French descent. Fishing is the chief occupation. Co. seat, Yarmouth.

YARMOUTH, town, port of entry, and co. seat of Yarmouth co., Nova Scotia; on a small bay of the Atlantic and the Dominion and Atlantic railroad, 205 miles s.w. of Halifax. It is the chief shipbuilding place in the province, and has electric lights, electric street railroads, seminary, banks, and large fishery interests. Pop. '91, 6089.

YARMOUTH, a town in Barnstable co., Mass. It is on Cape Cod extending from Nantucket sound to Cape Cod bay, and is largely occupied with cranberry raising and agriculture. It has churches, public library and a national bank. Pop. '90, 1760.

YARMOUTH, GREAT, a municipal and parliamentary borough returning one member to parliament, an important seaport, and fishing and sea-bathing t. on the e. coast of Norfolk, 19 m. directly e. of Norwich, and 20½ by railway. It stands about 2½ m. above the mouth of the river Yare, on a slip of land about a mile and a half broad, washed on the w. by the Yare, and on the e. by the North sea. Between the town and the suburb of Southtown, or Little Yarmouth, on the right bank of the Yare, in Suffolk, communi-

cation is established by means of a bridge. Connected with Southtown is the village of Gorleston, near the mouth of the river. The principal streets of Yarmouth run parallel to the river, and are intersected by cross lanes or "rows," which, as a rule, are so narrow as to be impassable for ordinary wheel-carriages, being generally not more than from 5 to 8 ft. wide. The vehicles by means of which traffic is carried on in the rows are called "Yarmouth carts." They are low, narrow, and well suited for conveying heavy goods. A quay of nearly 2 m. runs along the river, and here are the town hall, the council chamber, and several other handsome buildings—the finest houses, however, being those built along the esplanade on the beach. There are many churches, schools, and other public buildings, including a sailors' home, fishermen's hospital, and military asylum, the principal church being that of St. Nicholas (230 ft. long and 112 ft. high), founded in the 12th c., a handsome cruciform building with a tower and spire 168 ft. high. The town also contains a monumental column, 144 ft. high, to the memory of Nelson. On the coast are several batteries, three piers, besides two at the harbor mouth, several public gardens, and a marine drive and promenade 2 m. long. Vessels of over 200 tons can enter the harbor, which is formed by the Yare. Yarmouth is the principal seat of the English herring-fishery; deep-sea fishing, the produce of which is forwarded daily to London, is also carried on, and employs many hands. The curing of fish, especially of herrings, is important, and the "Yarmouth bloater" is highly esteemed in London and throughout the country. A very extensive export trade in agricultural produce, herrings, and malt is maintained. Shipbuilding is carried on, and the manufacture of ropes, sails, nets, and silk goods; there are also foundries, tan-works, and flour-mills. A new town-hall has been erected at a cost of £50,000. The coast is dangerous, but in Yarmouth roads, inside a line of sandbanks, there is safe anchorage. Pop. '91, 49,318.

YARN. The name applied to the thread spun for the purpose of weaving cloths of various kinds. It varies not only in the materials of which it is made, but also in the fineness to which it is spun. This latter quality is of great importance, as upon it depends entirely the evenness and quality of the manufacture. In order that uniformity may be insured, a pound of the material is taken as the standard, and this is divided into *hanks* or *cuts*. Thus, with linen yarn, a hank or cut consists of 300 yards; and if it takes 25 of these hanks to make a pound, the yarn is called 25s; and if 40, 40s; and so on. A hank of wool or cotton consists of 840 yards. No material admits of such fine spinning as cotton.

YAROSLAV. See JAROSLAV.

YARROW. See ACHILLÆA.

YAR'ROW, a Scottish stream, rendered famous by song and ballad, rises a little over a mile e. of loch Skene, at the place where the counties of Dumfries, Peebles, and Selkirk meet. It flows in a general n.e. direction through Selkirkshire, and joins the Ettrick about 2 m. above the town of Selkirk, after a course of 25 miles. About 3¼ m. from its source it expands into the loch of the Lowes, which is a m. long, and a quarter of a m. broad. Leaving the loch of the Lowes, the small stream enters St. Mary's loch, separated by a narrow neck of land, on which stands St. Mary's cottage (Tibby Shiels'), from the other and smaller lake. St. Mary's loch is 3½ m. long, and nowhere broader than 7 furlongs.

YAR'ROW. See JARROW.

YASKA. See NIRUKTA.

YATES, a co. in w. New York, bounded e. by Seneca lake; about 342 sq.m.; pop. '90, 21,001. Iron ore is found. Co. seat, Penn Yan.

YATES, EDMUND HODGSON, b. London, 1831; son of Edmund, a well-known English actor. He was for many years chief of the missing letter dept. in the London post-office; was theatrical critic for the *Daily News;* was editor of *Temple Bar* magazine; and was the first editor of *Tinsley's* magazine. He resigned from the post-office, 1872, to give his whole time to literature; made a lecturing tour of the U. S., and was appointed London correspondent of the New York *Herald,* but resigned, 1874, and established *The World,* a London society journal which has met with great success. For publishing a libellous article in this journal he was sentenced to four months' imprisonment, 1885. Besides magazine articles, sketches, etc., he published a number of novels, among them *Land at Last, Pages in Waiting, Wrecked in Port, Nobody's Fortune, The Impending Sword.* He also wrote some dramas, and an autobiography, pub. 1885, entitled *Fifty Years of London Life, Memoirs of a Man of the World.* He died in 1894.

YATES, JOSEPH C., 1768–1837; b. N. Y.; admitted to the bar, and practised at Schenectady, of which he was mayor, 1798–1808. He served in the state senate, 1806–7, was a justice of the New York supreme court, 1808–22, and governor of New York, 1823–25. He was one of the founders of Union college. Yates co., N. Y., is named from him.

YATES, RICHARD, 1818–73; b. Ky.; graduated at Illinois college, and was called to the bar. He soon began to take an active part in public affairs, and after several terms in the Illinois legislature was elected to congress on the whig ticket and remained there,

1851–55. He was governor of the state of Illinois during the war of the secession, and rendered important service in raising troops. He was U. S. senator from Illinois, 1865–71. His natural abilities were recognized as great.

YATES, Robert, 1738–1801; b. N. Y.; studied law, was admitted to the bar, 1760, and practiced at Albany. He was a member of the provincial congress of 1776 and of the committee of public safety. In 1776 he was made a judge of the supreme court of New York and became chief-justice in 1790. He was a member of the convention which framed the U. S. constitution, and his notes on the proceedings of that body were published posthumously.

YATES, William, D.D., 1792–1845; b. England; studied at Bristol, became a missionary, and in 1815 was sent to India by the Baptist association. Here he remained until his death, with the exception of a trip to England and the United States in 1827. He translated the New Testament into Hindu, Bengalee, Hindustanee, and Sanskrit; the Old Testament in whole into Bengalee, and in part into the other tongues. He published a grammar of Sanskrit, 1820, and other philological works. Returning to England in 1845, he died on the Red sea.

YAVAPAI, a co. in n. Arizona, bounded n. by Utah and intersected by the Colorado river; 29,236 sq.m.; pop. '90, 8685, chiefly of American birth. The region is noted for its precipitous and picturesque cañons of the Colorado Chiquito. Gold and silver are found. Co. seat, Prescott.

YAW, in the motion of a ship or boat, is the term for describing an irregular deviation in the course steered. A very chopping wind or sea *may* produce this effect, but the helmsman would usually have the credit of bad steering.

YAWL, a decked boat having two masts, on the first of which is a lugsail and topsail; and on the aftermost, which rises almost from the stern-post, a driver or fore-and-aft sail. It is a very easily managed rig.

YAWNING may be either the simple result of deficient aëration, or may be brought on by the mere sight of the act in another person, and is a modification of the ordinary movements of respiration, in which the inspiration is deeper than usual, and is accompanied by a kind of spasmodic contraction of the muscles which depress the lower jaw, and by a great elevation of the ribs and to some degree of the shoulder-blades. "The purely involuntary character of the movement," says Dr. Carpenter, "is sometimes seen in a remarkable manner in cases of palsy, in which the patient cannot raise his shoulder by an effort of the will, but does so in the act of yawning. Nevertheless, this act may be performed by the will, though not completely; and it is one that is particularly excited by an involuntary tendency to imitation, as every one must have experienced who has ever been in company with a set of yawners."—*Principles of Human Physiology*, 8th ed., p. 280.

YAWS, known scientifically as *frambœsia*, is a cutaneous eruption of a very peculiar nature, which commonly attacks negroes, but has been noticed in Europeans. The disease is preceded by languor and pain in the limbs, and shivering, succeeded by heat and restlessness, and is more severe in children than in adults. After a few weeks, the pure glossy-black color of the skin gives place to a dirty dull tint; and the patients often not only loathe food, but take to eating coals, chalk, earth, etc. The skin is then covered for a few days with a white mealy scurf, as if it had been dusted with flour, after which pimples like pin-heads appear on the forehead, face, neck, groins, etc., which increase for a week or more, growing into crusted pustules, which enlarge until the base attains the size of a sixpence, or even a shilling. If the crust is removed, a foul sloughing sore is exposed. The pustules may, however, burst spontaneously, and discharge a thick viscid matter, which hardens to a scab on the surface. In the larger pustules this surface at length becomes elevated into a red granulated excrescence, not unlike a wild raspberry (*frambœsia*), which is the true and characteristic yaw. In size it may vary from that of a pea to that of a mulberry, and in color it varies with the general health of the patient from a red to a pale white tint. It has very slight sensibility, and never properly suppurates, but discharges a glutinous fluid, which communicates the disease by inoculation. When the yaw has remained for some time, it diminishes in size, and as the pustule heals, is finally covered with skin, leaving little or no mark. When the disease seems to have reached its height, one pustule becomes much larger than any of the others, and instead of being elevated, is depressed. This is termed the master or mother yaw, and requires much care. When the mulberry-like excrescences appear on the soles of the feet, the resistance of the thick epidermis excites great pain. They are then termed by the negroes *tubbœ*, or crab yaws. This disease is endemic among certain tribes of native Africans, and is common among the negroes of the West Indies and of North and South America. It is contagious, and cannot be communicated except by the actual contact of yaw-matter to the abraded skin, or by inoculation, which is sometimes effected by means of a large fly called the yaw-fly. The interval between the reception of the poison and the formation of the eruption varies from seven to ten weeks. The disease scarcely ever attacks the same individual more than once. "Yaws," says Dr. Craigie, in his learned work on *The Practice of Physic*, "are liable to be confounded with the secondary [tertiary?] or

cutaneous symptoms of syphilis, with sivvens,* with the Arabian leprosy, with radesyge, pellagra, and the red leprosy of Cayenne." Several writers of eminence regard yaws as the same with the disease described in Leviticus, chap xiii., as the Jewish leprosy, but the description of the symptoms there given is not sufficiently precise to furnish sufficient evidence regarding their identity. With regard to treatment, mercury does more harm than good, and all that can be done with advantage is to render the progress of the morbid processes as little painful as possible. The most important remedial agent is the warm bath; and blood-purifying drinks, such as decoction of sarsaparilla, etc., may be prescribed. The Africans have their own native remedies in the bark of trees called *yuffo* and *bullanta*, taken in infusion or decoction; and to destroy the mother-yaw they adopt the following barbarous process: Iron is boiled in lime-juice with a quantity of the common black ants and of Malaguetta pepper, and the liquid thus prepared is applied hot to the yaw.

YAZOO', a river of Mississippi, formed by the union of the Tallahatchie and Yalabusha, runs s. and s. by w. in a very serpentine course, in a deep, narrow, sluggish channel, between fertile cotton plantations, and empties into the Mississippi river, 12 m. above Vicksburg; it is 290 m. long, and navigable at all seasons.

YAZOO, a co. in w. Mississippi, bounded s. by Big Black river; 1020 sq. m.; pop. '90, 36,394. Co. seat, Yazoo City.

YAZOO FRAUD, a term commonly applied to the sale by the state of Georgia in 1795 of her western territory, now included in Alabama and Mississippi, to several land companies. The consideration was $500,000. In 1789 a similar sale had been made, but owing to defective Indian titles was inoperative. The territory was described as extending from the Alabama and Coosa rivers to the Mississippi, and from the 35th to the 31st parallels of latitude. It was believed that the legislature had acted from corrupt motives. President Washington referred to the matter in a message to congress. The people of the state were indignant and excited, and a party was formed, led by Senator James Jackson, which agitated for the repeal of the sale. This was brought about in 1796, and the records of the transaction were burned in the presence of the governor and legislature. The territory in question was ceded to the United States in 1802. In 1803 a commission was appointed by Jefferson under an act of congress to investigate the Yazoo claims. Madison, as chairman, recommended a compromise, but Georgia refused to compensate the claimants. Their claim was sustained in the U. S. supreme court, Marshall, C. J., holding that allegations of bribery of the legislature could not be entertained, and that purchasers from the land companies were innocent holders without notice. Accordingly in 1814 congress ordered the lands to be sold and $5,000,000 to be appropriated for extinguishing the Yazoo claims.

YEADON, a t. of the West Riding of Yorkshire, England, 8 m. n.w. from Leeds. It stands on a hill, on the left side of the valley of the Aire. It has considerable woolen manufactures. Pop. '91, 7396.

YEAR, a division of time containing a complete course of the seasons, and depending upon the revolution of the earth (q.v.) round the sun. Its duration was variously determined by the nations of antiquity; the earliest method being the conventional one of making it include a certain number of lunar months; the lunar month being, after the day, the first period of time which was fixed. Twelve lunar months, giving a year of 354 days, were first taken as a near approach to a course of the seasons. This, though a pretty close approximation to the true value of a year, was yet so incorrect (being defective by more than 11 days) that it was soon found to be necessary to intercalate these 11 days, in order to preserve the year in a constant relative position to the seasons. The intercalation was variously effected; thus, the Egyptians, who knew the year of 365 days previous to 1500 B.C., divided it into three seasons ("winter," "summer," and "the Nile," i.e., *the inundation of the Nile*) of four months each, made each month contain 30 days, and introduced five intercalary days at the end of the 12th month; the Greeks, who generally retained the lunar year of 354 days, added 3 months in the course of every eight years, giving an additional month to the third, fifth, and eighth year of each cycle; the Romans also added additional days, but their system of intercalation was continually changed, not always for the better, till Julius Cæsar caused the adoption of the solar year. The Romans likewise abolished, in Asia, Egypt, and all the other countries under their sway, the old method of reckoning by lunar years, and compelled the adoption of the Julian calendar, according to which the year was assumed to contain 365 days 6 hours. The substitution of the Gregorian calendar in the 16th c. introduced for the average length of the solar year, 365 days 5 hours 49 minutes, which differs only by a few seconds from its true value; and this small annual error, as well as the excess of

* As sivvens or sibbens, and radesyge, are diseases not much known to the general public, and not noticed in this work, we may mention that sibbens is a tubercular affection of the skin, often extending to the deeper tissues, very infectious, and said to be endemic in Dumfriesshire, Ayrshire, and Galloway, first described about a century ago by Dr. Ebenezer Gilchrist; while the radesyge, spedalskhed, spedalska, liktraa, northern leprosy, or marsh sickness, is endemic in various parts of Scandinavia, consisting in its fully developed form of "an eruption of pimples, scales, patches, and tubercular pustules on the skin, terminating in pusiform discharge, with or without ulceration."—Craigie, *op. cit.*, vol. i. p. 690.

the true year over the year of 365 days, is compensated for by means of a succession of *leap-years* (q.v.).

The time at which the year began varied much among different nations. The Carthaginians, Egyptians, Persians, Syrians, and other eastern peoples commenced their year at the autumnal equinox, at which time the civil year of the Jews also began, though their sacred year was reckoned from the vernal equinox. The commencement of the Greek year was at the winter solstice before Meton's time, and was then changed to the summer solstice. The Romans were the first to adopt the 1st day of January as the first of the year, but their example was not followed by subsequent European nations for some time. In France, the commencement was Mar. 1 under the Merovingians, Mar. 25 under the Carlovingians, Easter under the Capetians, and Jan. 1 from 1564. The ecclesiastical year in Europe generally commenced on Mar. 25 (see DATE). The ancient northern nations reckoned their year from the winter solstice; the Russians, till Peter the great's time, from Sept. 1, and the same reckoning, known as the Byzantine era, was in use in the eastern empire. Of necessity, the commencement of the year among Mohammedan nations has no fixed position in relation to the sun's course or the seasons, it being invariably a lunar year. In astronomy there are several kinds of years depending upon the various configurations of the earth in its orbit, and consequently varying in length. First, there is the *tropical*, or as it is sometimes incorrectly called) *solar* year, which, from its being recognized in legislation and history, and commonly applied in the measure of time, has also received the name of *civil* year. This year is defined as the time which elapses from the sun's appearance on one of the tropics to its return to the same, and has a mean length of 365.2422414 mean solar days, or 365 days 5 hours 48 minutes 49.7 seconds (see PRECESSION). Next is the *sidereal* year, which is the period required by the sun to move from a given star to the same star again, and this year, affected as it is by nutation (q.v.) only, is one of the most invariable quantities which nature presents us with, and has a mean value of 365.2563612 mean solar days, or 365 days 6 hours 9 minutes 9.6 seconds. The time which elapses between the earth's arrival at its perihelion (q.v.) and its return to the same position, is known as the *anomalistic* year, and is equivalent to 365.2595981 mean solar days, or 365 days 6 hours 13 minutes 49.3 seconds. The sidereal and anomalistic years have a merely astronomical importance.

YEAR AND A DAY, a period of time much used in law as a limit to privileges and perils. For example, if the owner of an estray challenged it within a year and a day he could recover it; if a wounded person die within that time his death may be accounted murder; when a judgment is reversed a new action may be commenced within the limit; if the execution of a judgment be delayed beyond the limit it cannot be issued without a renewal of legal process; so in case of prize, or of goods saved if no claim be entered within the limit the condemnation to the parties in possession follows as a matter of course. The same period was recognized in the civil law, book of feuds, and the laws of the Lombards. And the year was not always limited to a precise calendar year. With the Gothic nations it meant a year and six weeks.

YEAST. In the process of fermentation of saccharine fluids containing albuminous matter, as in brewing or wine-making, the originally clear fluid becomes turbid, carbonic acid is evolved, and the substance causing the turbidity gradually separates in a graying foaming mass of a bitter taste and an acid reaction. This is yeast; and on examining it under the microscope, it is found essentially to consist of aggregations of small oval cells of a vegetable nature, known as the yeast-cells, yeast-plant, or *torulà cerevisiæ* (q.v.). Yeast, as is well known, has the property of setting up fermentation in saccharine solutions; and beer-yeast, the kind with which we are specially acquainted, possesses, according to Prof. Miller, this power in the highest degree, as may be shown by dissolving 4 parts of pure cane-sugar in 20 parts of water, and adding 1 part of fresh yeast: if this mixture be exposed to a temperature of about 80°, in less than an hour fermentation will have commenced. The investigations of Mitscherlich have led chemists to distinguish two varieties of yeast—viz., the *ober-hefe*, or surface-yeast, and the *unter-hefe*, or sediment-yeast, the former collecting on the surface of the fermenting fluid, and the latter forming a sediment. Surface-yeast is propagated by buds (see TORULA CEREVISLÆ) and sediment-yeast by spores; and each variety produces specific results upon the fermenting fluid. The fermentation induced by the surface-yeast is rapid and irregular; while that produced by the sediment-yeast is slow and quiet. The surface-yeast is formed when the saccharine fluid ferments at a temperature of from 65° to 77°; while the sediment-yeast is chiefly produced when fermentation takes place at the lower temperature of from 32° to 45°. In their chemical relations, the two varieties present no apparent difference. On treating yeast with a solution of potash, a cellulose-like substance remains, while an albuminate is dissolved. The action of yeast is destroyed by exposing it to a temperature of 212°, by alcohol, by the strong mineral acids, chlorine, iodine, and bromine, oxide of manganese, creosote, etc.; on the other hand, it may be dried at a low temperature, or by pressure, and may be preserved in this state without losing its activity. The part which the globules of yeast play in exciting the conversion of sugar into alcohol and carbonic acid, is very obscure; but an experiment of Mitscherlich seems to show that the sugar ferments only in those points which are in actual contact with the globules. Pasteur's experiments render it probable

that the process of fermentation is connected with the assimilation of the sugar by the yeast-plant during the development of the yeast-globules, or, in other words, that "the essential condition of fermentation is the conversion of albuminoid matter into organized globules."

According to Mitscherlich's analysis, the cells of ordinary washed yeast in a condition to excite fermentation contain (the ashes being deducted): carbon, 47.0; hydrogen, 6.6; nitrogen, 10.0; sulphur, 0.6; oxygen, 35.8; while spent yeast (after fermentation had ceased) contained only 5 of nitrogen. The inorganic matter amounted to 7.3 per cent of the dried yeast, and consisted entirely of phosphates.

The economic uses of yeast in bread-making, brewing, etc., are noticed in other articles. Beer-yeast (*cerevisiæ fermentum*) is an article of the British Pharmacopœia. It is employed as a stimulant in the advanced stages of low fevers, and is especially serviceable in cases where, in consequence of inflammatory symptoms, wine is inadmissible. Neligan has found it of great service in intense tympanitis following parturition. The dose is two tablespoonfuls every three hours, and it may be given in camphor mixture or peppermint water. Yeast-poultice forms an excellent stimulating application to foul and irritable sores. It is composed as follows: Take of yeast, six fluid ounces; flour, fourteen ounces; water heated to 100°, six fluid ounces. Mix the yeast with the water, and stir in the flour. Place the mass near the fire till it rises. This poultice should be renewed every six or eight hours. Its special efficacy depends upon the carbonic acid gas which it evolves.

If surface-yeast or under-yeast be collected and placed on a cloth to drain, and then pressed until nearly dry, it can be kept with care for several months, and in that state is what is called GERMAN YEAST, for which a large trade has sprung up within the last few years; the imports to Britain from the continent having amounted, in the year ending Dec. 31, 1880, to 208,123 cwts., valued at £544,783. It is chiefly imported from Holland and Hamburg, and is obtained mostly from the great continental distilleries. Nearly the whole of this large quantity is consumed by the bakers. PATENT YEAST is exactly similar, but is raised from a wort made purposely from malt and hops. ARTIFICIAL YEAST is a dough of wheat or other flour, mixed with a small quantity of common yeast, and made into small cakes, which are dried. If kept free from damp, it long retains its fermentive power. See BAKING POWDERS.

YEDO, or YEDDO. See TOKIO.

YEISK. See JEISK.

YEKATERINBURG. See EKATERINBURG.

YEKATERINOSLAV. See EKATERINOSLAV.

YELATOM. See JELATOM.

YELETZ'. See JELETZ.

YELL, a co. in w. Arkansas, bounded n. by the Arkansas river; 936 sq.m.; pop. '90, 18,015. Co. seat, Danville.

YELL, one of the Shetland (q.v.) islands, and, after Unst, the farthest n. of that group, is separated from Mainland by Yell sound, and from Unst by Blue Mull sound. It is 17 m. in length, 5½ m. in average breadth. Area, 94 sq.m.; pop. '81, 2529. The w. coast is rocky and precipitous, but on the whole the surface is tame, and consists largely of moorlands—the greatest elevations being no more than 400 ft. above sea-level. Agriculture is in an unusually backward state, and, though the surrounding seas are generally stormy, fishing is the chief employment.

YELLOW BERRIES. See BUCKTHORN.

YELLOW-BIRDS, *Chrysomitris tristis,* a bird of the finch family (*fringillidæ*), a native of North America, where it is very widely distributed. It is rather more than 5 in. in entire length; the male in summer plumage of a bright yellow color, with black crown, wings, and tail, the upper and under tail-coverts white. The female is yellowish brown above, and ashy brown below, and the male assumes a very similar plumage in winter. Yellow-birds are often seen in large numbers, feeding on seeds of thistles and other plants, and seldom alighting on the ground. The nest is made of lichens fastened together with saliva, and lined with soft substances. The song of the yellow-bird is very pleasing; and it is a sprightly and attractive cage-bird, easily tamed, and capable of being taught tricks. Several allied species are found in the western parts of America.

YELLOW COLORS. The yellow pigments employed by painters are: 1. The varieties of chrome prepared from chromate of lead. See CHROMIUM. 2. Several colors technically called *pinks*—as *brown pink,* prepared as a lake from a decoction of French berries and fustic; and *English pink* and *Dutch pink,* both lakes, prepared by different processes from French or yellow berries and turmeric. 3. *Naples yellow,* a mixture of metallic antimony, red-lead, and oxide of zinc calcined, added to a small quantity of lime, then fused, and afterwards ground to powder. 4. *King's yellow* is a tersulphuret of arsenic. 5. *Patent yellow* consists of 28 parts of chloride of lead and 27 parts of carbonate of lead well mixed in powder, and then fused together. 6. *Weld yellow* is prepared from a decoction of weld (*reseda luteola*), or dyer's weed with alum, and is, in fact,

another yellow lake. It is much used in paper-staining. 7. *Gamooge*, which constitutes the chief yellow color used in water-color painting.

YELLOW-EYED GRASS, a genus of grasses, *xyris*, of the order *xyridaceæ*, or yellow-eyed grass family, the members of which are rush-like herbs with equitant leaves, sheathing the base of a naked scape, which is terminated by a head of triandrous flowers. The three-valved, and usually one-celled pod, contains several or many orthotropous seeds with a minute embryo at the apex. More than 50 species of *xyris* have been described, of which 15 are found in the northern United States.. *X. flexuosa* has a slender scape from 10 to 16 in. high, slightly flattened at the summit, smooth, and much longer than the narrow linear leaves. Grows on sandy bogs all along the Atlantic coast from Massachusetts to Virginia, and also in some of the central western states. *X. torta* grows on the New Jersey pine barrens and in the southern states in dry sand. Scape nearly round, with one sharp edge, and slender, from 9 to 20 in. high, springing from a bulbous base, and in time becoming spirally twisted with the linear-filiform rigid leaves; head ovoid, becoming spindle-shaped and acute, from one-half to three-quarters of an inch long; sepals longer than the bract, and lateral sepals winged on the keel and fringed above the middle. In the same localities is found *X. fimbriata*, having an angled scape, two-edged above, 2 ft. high, rather longer than the linear sword-shaped leaves, the base not bulbous; head oblong, from one-half to nearly an inch long. *X. Caroliniana* is found in sandy swamps from Rhode Island to Virginia and southward, along the coast; scape rather flat, from 1 to 2 ft. high.

YELLOW FEVER is a disease endemic in low districts near the sea, but under certain circumstances sporadic in other places, never appearing beyond 48° of n. lat., nor without a temperature of at least 72° F., nor above the elevation of 2,500 ft. above the level of the sea, depending in part on causes not yet known, but in circumstances favorable to its production, capable of being propagated by contagion. It usually commences suddenly (generally in the night or early morning) with a sense of coldness, a rigor, or actual shivering, followed by vascular reaction, as shown by the heat and dryness of the skin, headache, especially over the eyes, and pain of the eyeballs, which are suffused, and have a strange drunk-like aspect. The limbs and loins are painful; the tongue is loaded, and its edges are red. There is a peculiar and characteristic flush or suffusion of the face, occupying a zone of about an inch above and below the eyes. Nausea, gastric uneasiness, and a tendency to vomit soon supervene. These symptoms may gradually lessen, and the patient will then regain his ordinary health in 24 or 36 hours; but if the symptoms persist, they soon become more aggravated, and the stomach ejects at first a clear fluid, which soon becomes of a dirty-brown tint, and is finally succeeded by the true *black vomit*. A yellow tint on the conjunctiva is observed, which extends to the skin of the face; and as the disease advances, the whole body becomes of a yellow color, varying in intensity from a pale lemon to a deep orange tint. The anxious countenance indicates the distress of the patient, who appears to be agitated by fearful apprehensions or incipient delirium. The skin feels constricted, and is of a pungent heat. The bowels are constipated, and the red, clean, and tremulous state of the tongue indicates the presence of intestinal irritation, and consequently the increase of danger. The urine and other excretions are more or less suppressed. Eructations, hiccoughing, and vomiting increase the distress and weakness. The disease in fatal cases usually terminates on the second or third day. The above train of symptoms is by no means constant. Sometimes, when everything seems favorable, black vomit suddenly appears, and the patient immediately succumbs. In other cases, patients experience no symptoms except severe pains in the legs and suppression of urine, and die without taking to their beds. In all cases terminating fatally, albumen appears in the urine on the second or third day. In females, the catamenial discharge is sure to appear, whether due or not. The discharges from the bowels, toward the close of the disease, may be black or dark green, and these dark evacuations are succeeded by what is termed the "caddy-stool," resembling dark sandy mud. As yellow fever is not a disease of this country, we shall not enter more fully into its symptoms. According to Dr. Jackson, who has written an excellent treatise on this disease, the usual course of yellow fever in its most concentrated form consists of 12 hours of forming period, 36 or 38 of formed or proper fever, and 24 or 36 of declining or concluding period. When the symptoms are less intense, the patient may survive to the 14th day. In the milder modifications of this disease, the morbid symptoms are prolonged to a considerable extent. Death may occur at any period of the disease, and the mode in which it occurs is by syncope (fainting), uræmia (or poisoning of the blood by the accumulation of urea), apoplexy, or asphyxia or suffocation. When the black vomit is plentiful, and the urine free, the intelligence remains unaffected, but the skin becomes cold and damp, the pulse small, and finally imperceptible at the wrist, and death ensues from gradual exhaustion and syncope. When the black vomit is scanty, and the urine suppressed, the poisoned blood acts upon the brain, and the patient exhibits wild delirium, followed by coma, convulsions, and death. The ratio of deaths to cases in the disease is always very high. From Tulloch's statistical reports on the diseases of soldiers, it appears that in the windward and leeward command, the ratio was 1 to 2¼ (or 3 in every 7 cases died), in the

Jamaica command it was 1 to 1⅛ (or 3 in every 4 cases died), while in Gibraltar it was 1 to 1⅞ (or 3 in every 5 cases died).

There are great differences of opinion as to the proper treatment of this disease. Dr. Blair, one of the highest anthorities on yellow fever, holds that the disease may be cut short or aborted by prescribing "20 grains of calomel added to 24 grains of quinine, afterward followed by two drams of carbonate of magnesia, and two ounces of sulphate of magnesia in eight ounces of peppermint water." These aborting doses were repeated at intervals of four or six hours, one dose being generally efficient, but four have been given before the quinine induced its special symptoms of cinchonism. Many physicians who have had much experience of this disease, have no belief in the abortive treatment; and some treat their cases with antiphlogistic or lowering remedies, and others with stimulants. It is probable that there is no one mode of treatment suitable for all cases, and that each should be treated according to its special symptoms. The extreme heat of the surface (a temperature of 107° has been observed in the arm-pit) may be relieved by the frequent application of the wet sheet; cupping or leeches often relieve the head-symptoms; and a blister to the gastric region may relieve the irritation of the stomach. If there is no suppression of urine, and if that fluid is free from albumen, morphia is of great service, but it must be given with great caution. The food should be of the mildest form, such as chicken-tea, arrow-root, sago, and barley-water, and these should be taken frequently in very small doses, in consequence of the state of the stomach. Similarly, with regard to all drinks, which are most likely to be retained if sucked through a tube or given by teaspoonfuls. Tea usually disagrees, but cold infusion of oatmeal, and very dilute brandy and water, are usually relished. Our highest authority on tropical diseases, sir J. Ranald Martin, states that, whenever the disease breaks out, "the most speedy means of prevention [of its spreading] in respect to towns and garrisons, will always be found in the removal of both the sick and the healthy to a locality where the temperature is sufficiently low, such as a neighboring range, or dry ventilated ground." In all ships on service on the w. coast of Africa and other unhealthy stations, the following rules (which we borrow from Dr. Aitken's *Handbook of the Science and Practice of Medicine*) should be strictly attended to. A prophylactic dose of quinine (five grains) should be administered to the men daily (a precaution that should be taken in all malarious regions, independently of yellow fever). Whenever the fever appears on board, the ship should at once put out to sea, and should proceed to the coolest atmosphere within reach. The most immediate measures of prevention should be, to obviate direct solar exposure, to prevent fatigue, and to check any excesses in the use of spirits. Seamen should be kept as remote from unhealthy coasts as is consistent with duty, anchoring every evening a few miles from the shore if possible. Duties in boats should as much as possible be conducted during the mornings and evenings, the noon-day heats and the deadly nocturnal emanations being to be equally avoided. When men are landed, they should be encamped on high and dry ground. Meals should be regularly served and carefully cooked, and coffee should be given early in the morning, and after unusual fatigue or exposure, and no work should be commenced till the coffee has been taken. Holds of ships should not be cleansed on the spots where the fever has originated, or during its prevalence, but the process should be deferred till the vessel is in a colder latitude. Lastly, green wood should not be placed on board ship in hot climates, but the wood should be barked and partly charred.

Dr. Craigie, in his learned *Practice of Physic*, gives the following extensive list of synonyms of yellow fever: "*Febris flama, Typhus ecterodes*, Sauvages and Cullen, *La Maladie de Siam, La Fièvre Matelotte, Vomito Prieto, Chapetonada, Fiebre* Aramilla *Hispanorum et Hispano-Americanorum;* new distemper of 1691; Kendal's fever, pestilential fever, bilious fever of Gamble; endemial causus or burning fever of Moseley; malignant pestilential fever of Chisholm; remittent and bilious remittent of Hunter; concentrated endemic fever of Jackson; tropical continued fever of Lempriere." We shall conclude with a short notice of the history of this disorder. Long before the arrival of Cortez in Mexico, an extremely fatal epidemic disease used to prevail among the native Mexicans. Epidemics of special severity occurred in 1545, 1576, 1736–37, and 1761–62. Although Humboldt thinks that the elevation of the table-land of Mexico (7200 to 7800 ft. above the level of the sea) is sufficient to exclude any idea of the identity of this disease, known as *Matlazahuatl*, with yellow fever, there can be little doubt, from the similarity of the symptoms, that the two diseases are really the same. The Europeans visiting the shores of America soon became painfully familiar with the disease; and it is almost certain that "the plague" which so often destroyed the English and Spanish troops at the end of the 15th and the beginning of the 16th centuries was in reality yellow fever. A disease bearing the character of yellow fever appeared in 1618 among the Indians in certain parts of Massachusetts, and prevailed with much severity till 1622, and it committed great havoc among the emigrants to Virginia. When the expedition against Hispaniola in 1655, under Venables, returned to Jamaica, they met there "an enemy (the plague) more severe than the Spaniards, which in a little time reduced the army, originally 7000, to fewer than 2000 men." There can be little doubt that this plague was yellow fever. In 1691 it was very fatal in Barbadoes, where it was known as the *new distemper*. From about this date yellow fever has been endemic in the West

Indies. It was unknown at Carthagena and along the coast till 1729, when it committed dreadful havoc; the Spanish galleons never remaining any time without interring one-half or at least one-third of their men. In 1740 it first appeared at Guayaquil, since which time it has often occurred; and in all the towns on the coast of the American continent and islands between 45° n. lat. and 10° s. lat. it appeared in proportion as Europeans began to visit them. "In this manner," says Dr. Craigie, "Vera Cruz, Cumaná, Havana, Acapulco, and La Guayra have successively become its endemial abodes; and its appearance in these towns is as uniform and certain as the arrival of the sun at the tropic of Cancer. Of these places Vera Cruz and Havana may be regarded as the nursery of yellow fever; and from the month of March to that of September or October the disease rages like a pestilence among the recently arrived Europeans, and those natives who descend from the elevated table-lands of the interior." Until the year 1793 the disease was regarded as having a spontaneous origin, and being due to tropical peculiarities operating on European and unseasoned constitutions; but that year the doctrine of infection suddenly started. In that year the disease appeared with great virulence in the island of Grenada, and rapidly spread over the Antilles to Philadelphia and many parts of the state of Pennsylvania, to Massachusetts, New York, Caroline co., Md., Alexandria in Va., several counties in North Carolina, and Caracas in Venezuela. This outbreak was preceded by a few days by the arrival of a vessel from Bulam, on the w. African coast, at a harbor in St. Grenada, in which vessel, when stationed off Bulam, fever had prevailed about five months before to a great and fatal extent. This disease was at the time termed the Bulam fever, but soon turned out to be ordinary yellow fever. Since 1763 yellow fever has very often appeared as an epidemic in the West India islands and various parts of the American states, and has even been endemic in various parts of the s. of Europe, especially Gibraltar and Malaga. From the testimony of many medical writers it is certain that a disease essentially identical with yellow fever prevails endemically along the w. coast of Africa, at Senegal, Sierra Leone, Cape Coast Castle, and the island of Fernando Po. Fortunately for Great Britain, this fell disease, which has repeatedly been brought to the coasts (Swansea, Southampton, etc.), is at once nipped out by our climatic conditions. When, in 1866, it was imported into Swansea, Dr. Buchanan, who was at once sent down by the government to watch the disease, and take the necessary measures to prevent it from spreading, recorded 12 instances in which, with filth, bad ventilation, and every other condition favoring the fever, it failed in every case to spread beyond the original victim. Altogether there were 20 cases, of which 15 were fatal.

The most terrible recent visitation of yellow fever scourged portions of the lower Mississippi valley in the autumn of 1878. In New Orleans and Memphis alone the deaths exceeded 5000.

The recent investigations that have been chiefly carried on by the American public health association indicate that yellow fever is a highly infectious disease, but not contagious, in the sense that small-pox is—one person taking it from another by breathing the same atmosphere. If the person sick with the disease wears garments brought from the infected locality, such materials may communicate the disease. The following facts submitted in a paper by Dr. D. W. Hand, surgeon U. S. army, at the annual meeting of the American public health association at Richmond, Va., in Nov., 1878, furnish strong evidence in favor of this view. In Sept., 1864, a violent epidemic of yellow fever broke out at New Berne, N. C. An occasional case had been seen there before, but no epidemic since 1779, when a large number of citizens died of it. New Berne was under martial law in 1864, and an examination of records shows that no vessel arrived there from any port s. of Beaufort, N. C., nor from any infected port, during the summer of that year, and no case occurred at Wilmington till near the middle of October. New Berne is situated on a low, sandy plain at the junction of the Neuse and Trent rivers, and is almost surrounded by swamps and marshes. In 1864 tight board fences surrounded nearly all the gardens and back-yards, and the privies and outhouses had been neglected. The drainage of the town was entirely on the surface, which being but little above the level of the river, made it defective. The summer was hot and wet, and the whole town was damp and moldy. There is very little ebb and flow of tide, but a succession of strong s.w. winds in August drove the water out, and for many days the tide was extremely low, leaving extensive mud flats exposed to the rays of the sun. At the same time a new embankment was made by the military authorities across the Neuse river-front, and large quantities of filth-saturated soil were exposed. Previous to this several small docks on both river-fronts had been filled up, partly with stable manure and street cleanings, for the purpose of extending the wharves. Between two of these was a row of old frame buildings used as commissary warehouses, several being built on piles, and under them the water had flowed and formed a cavern for which no drainage was provided. Dead rats and other vermin and filth made the pool in this cavern exceedingly poisonous. The above conditions, in the opinion of surgeon Hand, produced the peculiar germs of yellow fever. Upon noticing that the first and worst cases came from this point, an investigation was made, during which many workmen were made sick by the overpowering effluvium. Gradually the disease spread through the town, and by Nov. 1, nearly every inhabitant had had

an attack. The negroes generally had the disease mildly, as well as the children, but among the aged and persons recently from the north it was generally fatal. Among the attending physicians the fatality was very great. Of 23 medical officers of all grades, 21 had the fever and 11 died. Many sick were sent to other places, as Moorhead City, Beaufort, Hatteras, and Roanoke island, and of these many died, *but the disease did not extend to others.* At Moorhead City the patients removed from the hospital at New Berne were placed indiscriminately in the wards of a large general hospital, and citizens of New Berne were received at the hotel. Among them 21 soldiers and 34 citizens died of yellow fever, but the disease extended to none except they had visited New Berne or Beaufort. At other points the same immunity of non-exposed persons was noticed. Other facts, such as that brought forward by Dr. Toner, of Washington, that yellow fever has never been propagated within the limits of the United States at a greater altitude than 500 ft., indicate that the generation of the disease germs from filth requires certain geographical and meteorological conditions which still demand study. There is diversity of opinion as to treatment, but all concur in removal to a pure atmosphere, and thorough cleanliness. See GERM THEORY.

YEL'LOW-HAMMER, or YELLOW BUNTING, *Emberiza citrinella*, a species of bunting (q.v.), which is one of the most common of small birds in Britain, distributed over all parts of the country, and is common also in most parts of the continent of Europe from Norway and Sweden to the Mediterranean. It is about seven inches in entire length, and the male is a bird of brilliant plumage, although there is something in the short thick form of the bird, and in the tints and distribution of its plumage, which prevents it from being greatly admired for beauty. It is, perhaps, also the less regarded because it is so common; and in many parts of Britain there is a prejudice against it, so that boys who would think it wrong to rob any other bird's nest, esteem it a kind of duty to rob that of the yellow-hammer. In summer the plumage of the male, the head, cheeks, ear-coverts, and nape of the neck are bright lemon yellow, with a few dusky black patches; the upper part of the back and wings are reddish brown, tinged with yellow; the wing-primaries are dusky black, with narrow external edges of bright yellow; the secondaries, tertials, and wing-coverts dusky black, broadly margined with rich chestnut brown; the upper tail-coverts reddish chestnut, edged with yellow; the tail-feathers dusky black; the central pair edged with chestnut, and tinged with yellow; the chin, throat, and whole under surface, bright lemon yellow, clouded on the breast and flanks with reddish brown. The tail is slightly forked, and is shorter than that of the common bunting. The knob in the palate is also less conspicuous. The female has much less yellow about the head than the male, and her plumage is altogether much less vivid. The yellow-hammer frequents hedges and low trees, and is often to be seen, especially in winter, in the vicinity of houses, in flocks, with sparrows, chaffinches, etc. It generally makes its nest on the ground, under shelter of a bush or a tuft of grass, forming it of moss, roots, and hair. The song of the male is very sweet, and consists of few notes, which have been jocularly set to music with the words "*A little bit of bread, but no-o cheese.*" He is remarkably attentive to his mate, and takes his turn in incubation. In Italy great numbers of yellow-hammers are caught, and fattened like ortolans for the table. It is a curious and noteworthy circumstance that this bird is rare in insular situations; in the islands of the Mediterranean, as well as the Orkneys. The name Yellow hammer is a corruption of yellow-ammer; *ammer*, in German, signifying bunting.

YELLOW-LEGS, the *gambetta flavipes* (Bonaparte), a North American snipe, inhabiting the Atlantic coast of the United States. It is about 10 in. long from the tip of the bill to the end of the tail, with wings about 6 in. long. It is a delicious game bird. *G. melanoleuca* (Bonap.) is larger, being 14 in. long, wing 8 in., but similar in appearance, with ashy color above, under parts whitish, with transverse spots and stripes on breast and sides.

YELLOW MEDICINE, a co. in s.w. Minnesota; 612 sq.m.; pop. '90, 9854. Co. seat, Granite Falls.

YELLOW RIVER. See WHANG-HO.

YELLOW SEA. See WHANG-HAI.

YELLOWSTONE, a co. in s.e. Montana; between the Yellowstone and Musselshell rivers; w. of Custer co.; 3105 sq.m. Pop. '90, 2065. Co. seat, Billings.

YELLOWSTONE, a river of the United States; rises in a beautiful lake of the same name high up in the Rocky mountains, and receiving numerous branches from the s., flows north-easterly through the state of Montana, and empties into the Missouri river, in the n.w. part of North Dakota, lat. 48° 5′ n., long. 104° west. It is 800 yds. wide at its mouth, 1000 m. long, and navigable 700 or 800 m.

The region of the Yellowstone and its source was for the first time explored by parties from the United States in 1870–71, and seems to be one of the most wonderful spots in the earth. Making their way up the river through the grand scenery of the Rocky mountains, the explorers came to a district of a square mile in area, filled with hot springs in active operation, which cover the hillsides with snowy white deposit like a frozen cascade. Three or four miles around were occupied by springs which have ceased to flow. They are about 6,000 ft. above the sea, and are already resorted to by invalids. This was but the beginning of the wonders. Next they came to a terrific rift,

2,000 ft. in depth, with a river rolling in its deeps, "a grand, gloomy, terrible place." At the head of this cañon are the Tower Falls, with a sheer descent of 400 ft. The Grand Cañon, however, throws this into the shade. This fearful abyss is 3,000 ft. in perpendicular height, and to one looking up from the bottom, stars are visible in broad daylight. The ravine is full of hot springs of sulphur, sulphate of copper, alum, steam jets in endless variety, some of most peculiar form. The grandeur of the cañon is at once heightened and diversified by the Upper and Lower Falls; the latter one unbroken, symmetrical expanse, 350 ft. in height. Between this fall and the lake lies a region full of boiling springs and craters, with two hills 300 ft. high, formed wholly of the sinter thrown from the springs. Further on is a valley containing about 1500 geysers, some throwing up immense columns of water to the height of more than 200 ft. The beautiful lake from which the river issues is about 300 sq.m. in area, and is situated 7,738 ft. above the level of the sea. In 1872 the region at the source of the Yellowstone, 65 m. long by 55 m. broad, including the Grand Cañon and the lake, was reserved by Congress from occupancy, and set apart as a "public park or pleasuring-ground for the benefit and enjoyment of the people."

YELLOWSTONE NATIONAL PARK. See NATIONAL PARKS.

YELLOW-THROAT, a species of insessorial birds, the *geothlypis trichas* of North America, more particularly called the Maryland yellow-throat. It belongs to the family *sylvicolidæ*. It is 5½ in. long, with a wing 2½ in.; the male has a black band on the forehead, cheeks, and ear-coverts; the female is without the band. Both have the throat and breast yellow. Its nest is made upon the ground, in which it lays from four to six white, light-brown-spotted eggs.

YEMEN, in a wide sense, includes the whole s. and s.w. of Arabia; but, more strictly, is the name of only the south-western corner of the peninsula, bounded on the n. by Hedjaz and Nedjed; and on the e. by Hadramaut and the desert. It was known to the ancients as *Arabia Felix* (*Felix* being a mistranslation on the part of Ptolemy of *Yemen*, which does not mean "happy," but the land to the "right" of Mecca), and they obtained from it much frankincense, myrrh, and other costly balsamic substances, in which it abounds more than any other part of the world; they obtained also from its ports the products of India, and other eastern regions, with which its inhabitants maintained a constant trade. The history of Yemen reaches back to the highest antiquity. The Joktanides, descendants of Joktan or Kahtan, are its first possessors of whom we have any record; and from them it seems to have passed, about 2400 B.C., into the hands of the Himyarites, or Homerites. The Himyarite states and cities of Saba, Thaphar, and Athana or Aden, attained at an early period a high degree of prosperity, carrying on a great commerce both by sea and land, and they extended their dominion over a large part of Asia and the n.w. of Africa. See SABÆANS and ADEN. The persecution of the Christians by the last Himyarite princes led to the overthrow of the Himyarite power by the Abyssinians, 529 A.D. From this date till 601 Yemen was ruled by Abyssinian governors; then for a short time by the Persians, under Khosru (*Chosroes*) II. The followers of Mohammed did not succeed in subduing Yemen till they had for a considerable time been masters of the rest of Arabia. Under all the califs, and even under Saladin, Himyarite princes retained a partial independence, which they reacquired when the Turks, who conquered the country in the 16th c., were expelled in the century following. For more than two centuries afterward, the country remained under the dominion of a number of Himyarite princes or sheiks, the most powerful of them being for a time the Imám of Sanáa (q.v.). In 1871–73 it was reconquered by Turkey.

Our geographical knowledge of Yemen has been much increased by recent explorations, and charts of its coasts have been laid down by officers in the service of the East India company. Throughout the whole length of the country, at a distance of from 10 to 30 m. from the coast, a chain of mountains extends, between which and the sea is a tract of low ground, the *Tehama*, generally sandy and desolate, but in some places very fertile, and clothed with tropical vegetation. Inland from the mountain chain is a fertile table-land, at a general elevation of about 4,000 ft., yielding the productions of warm temperate rather than of tropical regions. Some of the mountains rise to a height of about 8,000 feet. The slopes even of the more lofty mountains are covered with luxuriant forests, and the mountain valleys are of unsurpassed fertility. The principal exports are coffee, dates, senna, gums and gum-resins, wax, ivory, and goat-skin morocco. Some grain is also exported. There are no rivers; but good habors are formed in some places by natural openings in the coral reefs which line the coast. The principal ports are Mocha (q.v.), famous for the coffee which it exports; Aboo Arish, or Gasim; Hodeida; Shehr; and Aden (q.v.), which is now in the hands of the British. Sanaa, the capital, or nominal capital, is situated on the table-land. Damar, Taas, Loheia, Beit-el-Fakih, and Zebeed are among the other principal towns.

YEN, a Japanese coin minted in both gold and silver. The gold yen is worth (1896) $0.997; the silver yen $0.528. See FOREIGN MONEY.

YENIKA'LÉ STRAIT, sometimes also called STRAIT OF KERTCH connects the sea of Azov with the Black sea, forming a sea-passage between the Crimea on the w. and the Caucasus on the east. It is about 19 m. in length, and at its narrowest is about 3 m.,

and so shallow and interrupted by shoals, that cautious sailing and steering are necessary even for small steamers.

YENISEI', the longest river of Siberia, formed by the junction of the Oulou-Keme and the Bey-Keme, which rise in the mountains on the southern border of Siberia. It flows n. through the center of Siberia into the Arctic ocean, forming at its mouth a long estuary. In the earlier part of its course it is interrupted by falls and rapids; but afterward flows through a great plain or steppe, receiving many tributaries, of which the principal are the Upper Tunguska or Angara, from lake Baikal; the Middle and the Lower Tunguska. The Yenisei is over 3000 m. long, and is traversed by steamers. Repeated voyages since 1875 have proved that it is possible during part of the summer for vessels from Europe to sail direct to the mouth of the Yenisei, and to carry back the varied produce of the immense basin drained by it.

YENISEISK, a government of Siberia, extending from the Chinese frontier to the Arctic ocean on both sides of the Yenesei river; 987,186 sq. m.; pop. '92, 480,546. The northern part is a frozen swamp, and the plain which inclines from the mountains to the ocean is inhabited by a few tribes of hunters. The southern part is mountainous and abounds in forests and the precious metals. There are many salt lakes yielding 50,000 cwt. of salt annually. There is much fishing and hunting. Minusinsk supplies the province with grain and cattle. One of the most important towns, although not the capital, is Yeniseisk (q.v.). Capital, Krasnoyarsk.

YENISEISK, a t. in the government of the same name in Siberia, on the Yenisei. Pop. '88, 7382. Yeniseisk is an important trading center, and has a great annual fair, the chief articles of trade being grain, fish, salt, spirits, and furs. It is 3 m. in circumference, and has a custom-house and arsenal.

YEO'MAN (Ang.-Sax. *gemen*, common), a term which seems, in early English history, to have been applied to a common menial servant, but after the 15th c. came to denote a class of small freeholders, forming the next grade below gentlemen. The term yeoman is sometimes considered identical with the forty-shillings freeholder, possessed of the elective franchise.

YEO'MANRY, a volunteer force of cavalry in Great Britain, numbering in 1880, 14,511 of all ranks, and costing the country annually about £80,000. It was formed during the wars of the French revolution, and then comprised infantry as well as cavalry; but the whole of the infantry corps, and many of the cavalry, were disbanded after the peace of 1814. The organization of the corps is by counties, under the lords-lieutenant. The men provide their own horses and uniform; in consideration of which they receive annually a clothing and contingent allowance of £2 a man, are exempt from taxation in respect to the horses employed on yeomanry duty, and draw during the annual training 2s. a day for forage, besides a subsistence allowance of 7s. a day. If called out for permanent duty, they receive cavalry pay, with forage allowance. The yeomanry are available in aid of the civil power; and in time of invasion, or apprehended invasion, the sovereign may embody them for service in any part of Great Britain, under the provisions of the mutiny act and articles of war.

YEOMEN OF THE GUARD, an English company, consisting of 100 old soldiers of stately presence, employed on grand occasions, in conjunction with the gentlemen-at-arms, as the body-guard of the sovereign. These yeomen were constituted a corps in 1485 by king Henry VII., and they still wear the costume of that period. Armed with partisans, and in the quaint uniform, the men present a curious sight in the 19th century. The officers of the corps are a capt. (ordinarily a peer), a lieut. and an ensign. There is also a "clerk of the cheque and adjutant." All these appointments are held by old officers, and are considered as important prizes. The whole charge is borne by the sovereign's civil list. The head-quarters of the corps is at the tower of London, where the men are popularly known as *beef-eaters* (q.v.).

YEO'VIL, a small municipal borough of Somersetshire, 33 m. s.w. of Bath, on the borders of Dorsetshire, a busy, handsome place, built of red brick and yellow Hamhill (a neighboring quarry) stone, and situated in a pleasing district on a hill-side sloping to the Yeo. The church of St. John, a structure of the 15th c., is much admired. The height of the side aisles, and large size of the windows, give it grace and lightness, and hence it has been called the "lantern of the west." There are several other churches, besides schools, alms-houses, and other charities. Kid and other gloves are here more extensively manufactured than in any other town in England. Woolen manufactures and leather-dressing are also carried on. Pop. '81, 8480; '91, 9648.

YER'CUM, another East Indian name of the plants called mudar (q.v.) and their fiber.

YESSO, or Jesso. See Yezo.

YETH'OLM, a parish of Scotland, in the n.e. of Roxburghshire, bordering on England, 15 m. e.n.e. of Jedburgh. The Beaumont water runs through the parish, and on either side of this stream are the villages of Kirk-Yetholm and Town-Yetholm, the former being the head-quarters of the gypsies in Scotland. According to the census of Scotland for 1880 the village of Yetholm contained 746 inhabitants.

YEW, *Taxus*, a genus of trees of the natural order *taxaceæ*, which is very generally regarded as a sub-order of *coniferæ*, and is characterized by solitary and terminal fertile flowers, with a solitary ovule sessile in the center of a fleshy disk, forming a sort of drupe when in fruit, and by dicotyledonous seeds. The genus *taxus* is distinguished by a solitary terminal seed, surrounded by a succulent cup. The species are diffused over the whole northern parts of the world, and are large and beautiful evergreen trees, with narrow lanceolate or linear leaves. The COMMON YEW (*T. baccata*), a tree of 30 to 40 ft., and a trunk sometimes of great thickness, branching a few feet above the ground, and forming a large and dense head, is a native of the middle and s. of Europe and of Siberia. Noble specimens of it are to be seen in many parts of Britain. It attains a great age, at least 300 or 400 years. Its wood has been much used from very early times for making bows, for which it is preferred to every other kind of wood. It is very hard, and reckoned almost equal to boxwood for fine work. The heart-wood is of an orange-red or deep-brown color. The fruit is red, and was long reputed poisonous, but the pulpy part is not so; the seed, however, is a dangerous poison. The leaves also are a powerful narcotic; and although they are sometimes given as a vermifuge, their use is attended with danger.—The IRISH YEW (*T. fastigiata* of Lindley; *T. Hibernica* of Hooker), originally discovered in Ireland, and now very common in pleasure-grounds, is by many supposed to be a mere variety of the common species, with upright fastigiate habit, but it differs also in having the leaves scattered, while those of the common yew are in two rows.—The NORTH AMERICAN YEW (*T. Canadensis*) is of humbler growth.—The name JAPAN YEW is sometimes given to *podocarpus macrophyllus*, a tree of a genus nearly allied to *taxus*, and recently separated from it. It is a large and stout tree, a native of Japan; its wood much valued for cabinet work. See illus., TREES, ETC., vol. XIV.

YEZD, a considerable city of Central Persia, situated on the s.w. of the great desert of Khorassan, in lat. 32° 10′ n., long. 54° 50′ east. It is the great emporium of the internal commerce of the empire. Manufactures of silk stuffs, velvets, cotton and woolen fabrics, arms, and loaf sugar are carried on, and the bazaars are spacious and well supplied. Pop. 40,000.

YEZO, or JESSO, the most northerly of the four principal islands which compose the empire of Japan, lies n. of the central island of Nipon. Till lately, the interior was almost wholly unknown. Under the new *régime*, Yezo has been thoroughly explored, and extensive measures have been taken to colonize the island and develop its natural resources. The area is 30,276 sq. m., and the pop. (1894) 339,455, chiefly resident in the s.; the Ainos, a docile aboriginal race, thinly occupy the north. The surface of Yezo is mountainous, with volcanoes; it is rich in fine timber; valuable minerals, especially coal, are found; the rivers and coasts abound in fish. Bears, deer, and wolves exist in large numbers. The chief towns are Matsumai (q. v.) and Hakodadi (q. v.).

YGG'DRASIL, the name given in Scandinavian mythology to a tree, the greatest and most sacred of all trees, which was conceived as binding together heaven, earth, and hell. It is an ash, whose branches spread over all the world, and reach above the heavens. It sends out three roots in three different directions: one to the asa-gods in heaven, another to the frost-giants, the third to the under-world. Under each root springs a wonderful fountain, endowed with marvelous virtues. From the tree itself drops a honey-dew. Among its branches and roots, several animals sit or run about: an eagle, a squirrel, four stags, a serpent, all having their own proper names. The serpent, Nithhöggr, lies at the under-world fountain and gnaws the root of Yggdrasil; the squirrel, Ratatöskr, runs up and down, and tries to breed strife between the serpent and the eagle, which sits aloft.

Of this old-world myth too imperfect an account has survived to enable us to read its meaning. Some writers in the middle ages bring it into connection with the cross. It is striking to find Virgil (*Georg.* ii. 291) describing the ash as sending its branches as high into the air as it sends its roots into the earth.

Jacob Grimm sees an intimate connection between the world-tree Yggdrasil and the *Irmenseule*, of which numerous traces are to be found in the records of German antiquity. This is described by Rudolf of Fuld as a great trunk of a tree set upright, and worshiped in the open air; the name *Irminsul*, he explains as meaning the universal or all-sustaining pillar (Ger. *Säule*, pillar). Such a tree-idol was destroyed by Charles the great in his conquest of the Saxons in 772, at a place called Heresburg, in Westphalia, which was a chief seat of the pagan religion of the Saxons. The word *irmin*, Ang.-Sax. *eormen*, was frequently compounded with other words in the earlier stages of the Teutonic languages, in the sense of universal, greatest of all. As the primitive nature-worship tended more and more to the personification of particular powers, these trunk-idols were associated with particular divinities, and perhaps had an image set upon them, or were cut into some rude resemblance, as in the case of the Greek pillar-images called *herma* (see HERMES). The coincidence of the names *irmin* and *hermæ*, which may, however, be casual, has not failed to be remarked. The Christmas tree of modern Germany may be some kind of offshoot of the old notion of Yggdrasil.

YIDDISH (YIDDISH-DEUTSCH, or JÜDISCHE-DEUTSCH). The Judeo-German dialect, spoken by large numbers of Russian, Polish and German Hebrews both in Europe and America, is called by this name. It is founded mainly on pre-Lutheran German, with a liberal infusion of Slavic terms, and was originally spoken in a primitive form by the

Jews who emigrated to Poland. The dialect is written in Hebrew characters. Pure Yiddish is even more classical than modern German, as it contains many features of old German which have been lost altogether in the language spoken since Luther's time. Take the word *Verlieren*, to lose, for example. The Hebrew makes a distinction between losing from the pocket and losing in trade or speculation, and to express the latter he has preserved the ancient German *Ohne-werden*, to become without. The philological student who undertakes to master Yiddish will be sadly puzzled over the numerous inconsistencies and disadvantages peculiar to this tongue, chief among which are the irregular use of the auxiliary verbs, and the confusion of vowels and diphthongs. For instance, in using the German word *gehen*, to walk, the Polish or Russian Jew will pronounce it *gine;* and *haben*, to begin, he will pronounce *hoiben*. Very frequently whole letters are swallowed, or an adjective is made to take the form of a verb, as in the case of the word *achpern*, a verb, which is usually substituted for the German adjective *achtbar*, noteworthy or honorable. Slavic or Hebrew endings are affixed to words of German origin, so that they become practically unrecognizable, especially when a diminutive is to be expressed; *Vögelchen*, little bird, for example, becomes *Vogele*, with the Russian ending, and *Carlchen* is rendered *Carle* as a term of endearment, and *Carlke* to express contempt. A wide variety of foreign words, according to locality and environment, which relate to business or to intercommunication with Gentiles have become gradually incorporated into Yiddish, and are used sometimes in a German, again in a Russian guise, and more frequently still as the result of a mixture of both grammars. In New York City, Yiddish is almost the only language of upwards of 30,000 Hebrews, and it is also probably understood in a greater or less degree by many whose affiliations are largely with Christians. Six or seven newspapers are published in the language, and there are three theatres where Yiddish plays are given. As spoken in this country, with the interpolation of countless English phrases, it has become a jargon that the European Jew would comprehend with difficulty. Yiddish literature can boast of a poet not unworthy of the title in Michael Gordon, a Russian Jew of Scotch descent, and on this side of the water. Isaac Myerdick has written stories, etc., of considerable merit.

Y'LANG Y'LANG. See IHLANG IHLANG.

Y-MOTH, *Plusia gamma*, a beautiful species of moth (q.v.) common in Britain and throughout great part of Europe, about an inch in entire length, without reckoning the antennæ, which are not quite half an inch. The color is lilac, variegated with brown, the upper wings beautifully marbled, with a shining mark nearly in the form of the letter Y, or of the Greek γ (gamma), whence the names.

YOAKUM, a co. in n.w. Texas, New Mexico, being its w. boundary; formed 1876; 840 sq.m.; unorganized. Pop. '90, 4.

YOGA (from the Sanskrit *yuj*, join; kindred to the Lat. *jung-*, Gr. *zeug-*, Gothic, *jiuk;* hence *junction*, and figuratively, "concentration, religious or abstract contemplation") is the name of one of the two divisions of the Sânkhya philosophy of the Hindus. See SÂNKHYA. While the first of these divisions, the Sânkhya proper, is chiefly concerned in teaching the *tattwas*, or principles of creation, and the successive development of the latter, the main object of the Yoga is to establish the doctrine of a Supreme Being, and to teach the means by which the human soul may become permanently united with it; and since the Sânkhya proper is silent on the creation of the world by a Supreme Being—whence it was charged, though unjustly, by its opponents, with being atheistical—the Yoga, which is called theistical, is considered to be its complement. According to *Patanjali*, the reputed author of this system, the term *Yoga* means "the hindering of the modifications of thinking;" and by such modifications, which, he says, may be accompanied with afflictions, or be free from them, he understands "the three kinds of evidence—viz., perception, inference, and testimony—misconception or incorrect ascertainment, fancy, sleep, and recollection." The "hindering of these modifications" is, according to him, "effected either by a repeated effort to keep the mind in its unmodified state, or by dispassion, which is the consciousness of having overcome all desires for objects that are seen (on earth) or are heard of (in Scripture)." Dispassion is conducive to meditation; this, again, is of different kinds, and is attained either "impetuously"—in adopting various transcendent methods—or "by a devoted reliance on *Is'wara*, the Lord." This Lord, or Supreme Being, Patanjali then defines as "a particular *Purusha*, or spirit, who is untouched by afflictions, works, the result of works, or deserts; in whom the germ of omniscience reaches its extreme limit; who is the preceptor of even the first, because he is not limited by time; and whose appellation is Om, the term of glory." This word is to be muttered, and its sense is to be reflected upon, for "from it comes the knowledge of Is'wara, and the prevention of "the obstacles" which impede Yoga. These obstacles, Patanjali says, are "illness, apathy, doubt, listlessness about the accomplishment of meditation, want of exertion, attachment to worldly objects, erroneous perception, failure to attain any stage of meditation, or inability to continue in the state of meditation when it has been reached." There are several other methods to prevent these obstacles from distracting the mind, and impeding its steadiness. One, for instance, consists in pondering over one single accepted truth; another in "practicing benevolence, tenderness, complacency, and disregard toward all objects in possession of happiness or grief, virtue or vice;" another, "in forcibly expelling or retaining the breath;" another, in "dwelling on knowledge that presents itself in dream or sleep;" etc. When all these modifications have disappeared, the mind becomes free from "the tingeing" of the exterior world, as the pure crystal is free from the color that seems to belong to it, when a

colored substance is seen athwart it. After having described the various modes in which the mind may appear changed into the likeness of what it ponders, the author of this system then proceeds to explain the practical Yoga, by which "concentration" may be attained. It comprises, according to him, mortification, the muttering of certain hymns, and a devoted reliance on the Lord. Through it meditation is established, and *afflictions* are got rid of. By afflictions, again, he understands ignorance, egotism, affection, aversion, and tenacity of life; which terms are then the subject of an especial investigation into the nature of what is to be got rid of, of what is not desired to be got rid of, of what is constituted by the cause, and of what is the constitutive cause.—There are eight means or stages subservient to the attainment of concentration—viz., forbearance (*yama*), religious observance (*niyama*), postures (*ásana*), regulation of the breath (*prán'áyáma*), restraint of the senses (*pratyáhára*), steadying of the mind (*dháran'á*), contemplation (*dhyána*), and profound meditation (*samádhi*).—The first stage, *forbearance* (*yama*), consists in not doing injury to living beings, veracity, avoidance of theft, chastity, and non-acceptance of gifts; they are the universal great duty.—The second stage, *religious observance* (*nyama*), comprises purity—external as well as internal—contentment, austerity, muttering of the Vedic hymns, and devoted reliance on the Lord.—The third stage of Yoga *postures* (*ásana*), is defined by Patanjali, as "that which is steady and comfortable" at the same time. The commentators mention several varieties of such postures. According to an interesting treatise on the Yoga philosophy by Navînachandrapâla, one of these, called *Siddhásana*, is practiced by placing the left heel under the anus, and the right heel in front of the genitals, by fixing the sight upon the space between the eyebrows, and, while in this motionless attitude, meditating upon the mysterious syllable *Om* (q.v.). Of the posture called *Padmásana* the same treatise says, that it consists in placing the left foot upon the right thigh, and the right foot upon the left thigh, in holding with the right hand the right great toe, and with the left hand the left great toe, the hands coming from behind the back and crossing each other; while the chin rests on the interclavicular space, and the sight is fixed on the tip of the nose. When the command of such postures is attained, Patanjali says, the Yogin does not suffer either from cold or heat, hunger or thirst, or similar afflictions. The fourth stage, *regulation of the breath* (*prán'áyáma*), is threefold, according as it concerns exhalation or inhalation, or becomes tantamount to suspension of the breath, the latter also being termed *kumbhaka* (from *kumbha*, a jar), because "the vital spirits then are as motionless as water is in a jar." Through such a regulation of the breath, the obscuration of the pure quality of the mind is removed, and the latter becomes fit for acts of attention. Navînachandrapâla describes different processes of the Prânâyâma as selected from different authorities. One, for instance, consists, according to him, in the act of inhaling through the left nostril for 7.6788 seconds, suspending the breath for 30.7152 seconds, and exhaling through the right nostril for 15.3576 seconds; then inhaling through the right nostril for 30.7152 seconds, and exhaling through the right nostril for 7.6788 seconds, suspending the breath for 30.7152 seconds, and exhaling through the left nostril for 15.3576 seconds; lastly, inhaling through the left nostril for 7.6788 seconds, suspending the breath for 30.7152 seconds, and exhaling through the right nostril for 15.3576 seconds. To the *kumbhaka*, of which there are eight varieties, the same author observes, two processes are indispensable: sitting in one of the postures described, and, by means of an incision in the frænum linguæ, and milking, as it were, the tongue, causing it gradually to become so lengthened as to allow the rima glottidis to be shut by pressing back the epiglottis with the point of the retroverted tongue. Such *kumbhakas*, it is supposed, produce the most wonderful effects: some of them cure diseases of the head and lungs, dropsy, etc.; others make proof against all sorts of inflammation and fever; the eighth or last variety of the *kumbhaka*, especially, cures all diseases, purges from all sins, promotes longevity, enlightens the mind, and awakens the soul.—The fifth stage of Yoga, the *restraint of the senses* (*pratyáhára*), means the withholding of the senses from their respective objects, and the accommodating them entirely to the nature of the mind. According to an authority quoted by Navînachandrapâla, a Yogin's senses are suspended when he can suspend the respiratory movements for 10 minutes and 48 seconds.—This stage is preparatory to the sixth, or *the steadying of the mind* (*dháraná*), which means the freeing of the mind from any sensual disturbance, by fixing the thoughts on some part of the body, for instance, on the naval or the tip of the nose. This stage, it is supposed, can be accomplished when the Yogin is able to suspend his respiratory movements for 21 minutes and 36 seconds; and, according to Navînachandrapâla, it is effected by different processes—muttering the syllable *om* 144,000 times, fixing the eyes upon the tip of the nose, or the space between the eyebrows, for two hours, swallowing the tongue for two hours, etc. *Contemplation* (*dhyána*), the seventh stage of Yoga, is the fixing of the mind on the one object of knowledge, the Supreme Spirit, so as to exclude all other thoughts. It is practiced in consequence of the "steadying of the mind," as defined before; and, according to the authority quoted by Navînachandrapâla, a man can accomplish it when he is able to suspend his respiratory movements for 43 minutes and 12 seconds.—The eighth and last stage of Yoga, *profound meditation* (*samádhi*), is the perfect absorption of thought into the one object of meditation, the Supreme Spirit; it is devoid, as it were, of any definite character, which would suggest a term as applicable to it. In such a state, Navînachandrapâla says, "a Yogin is insen-

sible to heat and cold, to pleasure and pain; he is insensible to blows and wounds, to the effects of fire; he is the same in prosperity and adversity; he enjoys an ecstatic condition. He is free from lust, fear, and anger; he is disengaged from all works. He is not affected by honor and dishonor. He looks upon gold, iron, and stones with the same unconcerned eyes. He is the same in love and in hatred; he is the same among friends and enemies." And, according to the authority he quotes, such a state may be attained by a man who can suspend his respiratory movements for 1 hour 26 minutes and 24 seconds. The last three stages are also comprised under one distinctive name, *samyam'a*, or "restraining," because it is chiefly on the perfection attained in these three collectively that depend the wonderful results which are promised to a Yogin when he applies them to the contemplation of special objects. Such results are, for instance, a knowledge of the past and future, a knowledge of the sounds of all animals, of all that happened in one's former births, of the thoughts of others, of the time of one's own death, a knowledge of all that exists in the different worlds, of stars and planets, of the structure of one's own body, etc. There are especially, however, eight great powers which a Yogin will acquire when properly regulating and applying the *sam'yama*—viz., the power of shrinking into the form of the minutest atom; that of assuming a gigantic body; that of becoming extremely light; that of becoming extremely heavy; that of unlimited reach of the organs (as touching the moon with the tip of a finger); that of irresistible will; that of obtaining perfect dominion over the inner organs of the body; and that of acquiring mastery over everything. If the Yogin applies *sam'yama* to the contemplation of the smallest divisions of time, and the successive order in which such divisions occur, he obtains a discrimination which enables him to understand the subtle elements, and to see all objects at once. When his intellect has become free from all considerations of self, and his spirit is no longer subject to the result of acts performed, and when both have thus obtained the same degree of purity, the Yogin obtains eternal liberation.—In the last chapter of his work, Patanjali then shows that these perfections are not always obtained by Yogins in one birth, but that *Prakr'iti*, or nature (see SÂNKHYA), generally in a succession of births, brings to maturity the result obtained in a prior birth. He thus makes nature, not actions, the cause of each effect; meritorious actions merely serving, according to him, to remove the obstructions which, from bad actions, would arise to its regular progress, just as water would take its natural course after the husbandman, who would want to lead it from field to field, had removed the obstructions that lay in its path. After having then taught that the result of actions, in successive births, consists in the recollection of a prior state, and in the obtainment of a special (existence, a special duration of life, and special enjoyments); and after having discussed the different influences to which the mind may become subject in its union to different objects, Patanjali winds up with describing the mode in which final liberation gradually takes place. First, he says, when a person has obtained the discrimination conveyed by the Yoga doctrine, all ideas of self—such as, I am different from another—cease. In consequence, thought is turned inward, and this is the commencement of liberation. But, as still recollections, derived from former existences, sometimes prevail in his mind, they must be abandoned by him in the same way as he has to overcome the afflictions, above specified. When he has succeeded in this, his knowledge will have become so infinite, that but little will remain for him to be known. Then the cosmical *gun'as*, or qualities, too (see SÂNKHYA), having accomplished the main object of spirit, will have gradually arrived at the end of their functions, and, as a consequence, matter will become separated from spirit. This is *kaivalya*, or true liberation, for the mere power of the mind to retain its nature after dissolution has taken place, is not yet true liberation.—The practical part of the Yoga was admitted into the later vedânta (q.v.). Its ethical portion is especially dwelt upon in the celebrated episode of the Mahâbhârata (q.v.), the *Bhagavadgîtâ*. But the great power it has at all periods exercised on the Hindu mind, is less derived from its philosophical speculations or its moral injunctions, than from the wonderful effects which the Yoga practices are supposed to produce, and from the countenance they give to the favorite tendency of orthodox Hinduism, the performance of austerities. It is needless, however, to say that frequently these practices were and are merely a cloak for imposture and hypocrisy, and that the professional Yogins (q.v.), numbers of whom are met with throughout India, are often nothing but lazy mendicants or jugglers, who, by impressing the vulgar with a belief in their supernatural powers, convert it into a source of an easy livelihood. Such followers of the Yoga pretend, for instance, to foretell future events; they deal in palmistry, and profess to cure diseases. There are instances, too, where, for a handsome consideration, they allow themselves to be buried for a certain time, so as to exhibit the power of the Yoga. Two such cases are related as authentic in the treatise of Navînachandrapâla; and it would appear from them, that a human being, after having undergone certain preparations, such as the Yoga prescribes them, may be shut up in a box without either food or drink, for the space of a month, or even forty days and nights, and yet remain alive. The author of the treatise endeavors, indeed, to show that the rules laid down by the Yoga regarding the mode of respiration, the postures, and the diet of a Yogin, may have been founded on a careful observation of the nature and habits of hibernating animals; and in support of this view, he enters into a detailed investigation of the effect of the Yoga

practices on animal life. If, as it seems, his statements are correct, much of what otherwise would be incredible in the accounts given of the performances of Yogins, could be received as true, because admitting of explanation. The system *patanjali* was taught by him in a little work called *yogasûtra*, which consists of four pâdas, or chapters, each comprising a number of sûtras (q.v.). The oldest commentary on it is ascribed to a *rydsa* (q.v.); and this was commented on by *Vachaspati-Mis'ra*. Of other commentaries, those by *Vijnânabhikshu*, *Bhojadeva*, and *Nâgojibhat't'a*, are the most approved of.—For a fuller enumeration of works on the Yoga, see *A Contribution toward an Index to the Bibliography of the Indian Philosophical Systems*, by Fitzedward Hall (Calcutta, 1859). The first two chapters of the sûtras have been translated, with annotations, founded on the commentary of Bhojadeva, by the late J. R. Ballantyne (Allahabad, 1853); and a paraphrase, but somewhat too free, of the same commentary is contained in the 4th vol. of William Ward's *View of the History, Literature, and Religion of the Hindus, etc.*, 4 vols. (London, 1817–20). For a brief account of the system, see also the 1st vol. of H. T. Colebrooke's *Miscellaneous Essays*, 2 vols. (London, 1837); and for the practice of the Yoga, *A Treatise on the Yoga Philosophy*—that referred to above—by N. C. Paul (i.e., Navînachandrapâla), (Benares, 1851).

YOGIN, a follower of the Yoga system of Hindu philosophy (see Yoga), but in popular acceptation a term generally denoting a Hindu ascetic or devotee, a man who has entered the fourth stage of religious life as described in the s'astras. A large class of such persons forms a division of the votaries of S'iva. See S'aivas.

YOICKS', supposed to be a corruption of the French *oyez*, "listen," "hear," is a hunter's cry of encouragement to his hounds when following the fox. See Tally Ho. Dame Juliana Berners (q.v.) gives in her *Book of Hunting* of the fifteenth century the cry "*Oyez, oyez, à Bemounde!* the last word being the name of a hound.

YOKOHAMA (Japanese for "cross shore"), a t. of Japan, in the island of Nipon, and the port for the foreign trade of Tokio. It is situated on the s. side of a bight of the bay of Yedo, about 18 m. from Tokio, and opposite to Kanagawa. In 1854, it was only a small fishing village, but after it supplanted Kanagawa as the treaty port of Tokio in 1859, it rapidly increased. The Japanese government built at a great outlay solid granite piers and landing-places, a large custom-house, official residences, and shops for Japanese traders; besides houses and godowns for the foreign community and merchants. It now extends along the sea-shore for about 1½ m., and is two or three streets deep. The custom-house is nearly in the center of the town; and e. and w. of it, lie respectively the foreign and native quarters. The shops are filled with goods to suit the foreign taste —such as lacquered ware of rare quality and bronze-work, baskets and porcelain, fancy silks and embroidery, curiosities and articles of *vertu*. Since the recent changes in the policy of the Japanese government, great improvements have taken place in the native quarter. Broad and cleanly streets are rapidly superseding the former dirty and narrow thoroughfares. A canal is drawn as a cordon around the settlement on the land-side, and in 1871 the Japanese government widened and deepened it very considerably. Other important undertakings have recently been carried out, the chief of which is a railway from Yokohama to Tokio. Pop. '94, natives 160,439; foreigners, about 3400.

YOLO, a co. in n. central California, bounded on the e. by the Sacramento river, and on the s. by Putah creek; about 972 sq.m.; population, 1890, 12,684, chiefly of American birth. Co. seat, Woodland.

YONGE, Charlotte Mary, a novelist of considerable merit and popularity, was born in the year 1823. She is a daughter of the late William Crawley Yonge, esq., of Otterbourne, Hampshire, sometime an officer in the 52d regiment. The work by which she is best known is *The Heir of Redcliffe*, which had great success, and has gone through several editions. Besides this, she is the author of *Heart's Ease; Dynevor Terrace; The Daisy Chain; The Lances of Lynwood; The Little Duke*, etc. These works exhibit much literary accomplishment, and have secured for Miss Yonge a public of her own. The spirit which pervades them is pure, amiable, and pious; and commonly the stories are more or less contrived as vehicles of the high church opinions to which the writer is warmly attached. Considerable sums accruing from the sale of her writings she is said to have devoted to the aid of religious missions in New Zealand. In addition to the fictions by which she is chiefly known, Miss Yonge has published a work *On Christian Names, their History and Derivation*, in which much curious erudition is displayed; *Life of Bishop Patteson* (1873); and several historical works.

YONKERS, a city in Westchester co., N. Y.; on the Hudson river, and the New York Central and Hudson River railroad; adjoining New York city on the n. It contains high, Halsted, and Lowden schools, public library, St. John's Riverside hospital, St. Joseph's hospital, Homœopathic home, Hollywood Inn for workingmen, a historical manor hall, gas and electric light and electric street railroad plants, and waterworks supplied from Grossy Sprain lake. There are about 30 churches, Y. M. C. A. and W. C. T. U. halls, Leake and Watts orphan home, Hebrew home for the aged and infirm, and Greylock, the suburban residence of Samuel J. Tilden. The U. S. census of 1890 reported for Yonkers, 628 manufacturing establishments, employing $10,989,789 capital and 11,303 persons, paying $5,877,145 for wages and $10,995,699 for materials,

and having a combined output valued at $21,319,017. The principal manufactures are carpets and rugs, hats, silk and silk goods, foundry and machine shop products, elevators; refined sugar, chemicals, and rubber and gutta-percha goods. The city was incorporated as a village in 1855, and chartered as a city in 1872. It has several national and savings banks, and daily, and weekly newspapers. Pop. '90, 33,033.

YONNE, a department in the n.e. of France, bounded on the n. by the department of Seine-et-Marne, on the e. by Aube and Côte-d'Or, on the s. by the Nièvre, and on the w. by Loiret. Area, 2868 sq. m.; pop. '96, 332,651. The department is watered by the river Yonne, which flows across it in a n.e. direction. The surface is hilly, many of the hills being covered with fruitful vineyards, the intervening valleys being beautiful and fertile. There are some fine forests in the department. The climate is generally healthy, except in the s.w., where the marshes often give rise to fever. The soil produces abundance of grain, but the cultivation of the vine is of the greatest importance, the best wines produced here being those of Chablis, Joigny, Auxerre, and Tonnerre. The chief mineral products are red granite, marble, lithographic stones, pavement, red and yellow ocher, iron. There are manufactures of cottons, woolens, beet-root sugar, bricks, tiles, etc. The chief exports are timber, corn, and wine. It is divided into five arrondissements—viz., Auxerre, Avallon, Joigny, Sens, Tonnerre. The capital is Auxerre.

YORITOMO, 1146–99; b. Japan; son of Yoshitomono Minamoto. He was the first of the mikado's subjects upon whom was conferred the title *Sei-i tai shogun* (great general who tranquilized the barbarians), the same office which in the American treaty of 1854 is ascribed to the "tycoon." He founded the city of Kamakura, near the modern Yokohama, in 1181; annihilated his rivals, the Taira family, after many bloody battles; and in 1192 received from the mikado the title and office by which Japan henceforth, until 1868, had two capitals or centers of power; two kinds of government, civil and military, or "the throne and the camp;" and two rulers, mikado and shogun (or tycoon), at Kioto and Kamakura (or later, Yedo). His life came to an end by the death of his grandson Sanctomo, by assassination.

YORK, a co. in s.w. Maine, bounded on the n. by the Ossipee river, on the e. by the Atlantic ocean, and on the s.w. by the Piscataquis and Salmon Falls rivers, which separate it from New Hampshire; about 920 sq.m.; pop. '90, 62,829, chiefly of American birth. Co. seat, Alfred.

YORK, a co. in s.e. Nebraska; 576 sq.m.; pop. '90, 17,279, chiefly of American birth. Co. seat, York.

YORK, a co. in s. Pennsylvania, adjoining Maryland, bounded on the n.e. by the Susequehanna river; about 910 sq.m.; pop. '90, 99,489, chiefly of American birth. Iron is found. Co. seat, York.

YORK, a co. in n. South Carolina, bordering on North Carolina; about 750 sq.m.; pop. '90, 38,831, chiefly of American birth, inclu. colored. Iron ore, gold, manganese, and limestone are found. Co. seat, Yorkville.

YORK, a co. in s e. Virginia, bounded by York river and Chesapeake bay; 75 sq.m.; pop. '90, 7596. Co. seat, Yorktown.

YORK, a co. in s.w. New Brunswick, separated from Maine by the St. Croix river; 3472 sq.m.; pop. '91, 30,979, many of Irish and of Scotch descent. Co. seat, Fredericton.

YORK, a co. of Ontario, Canada, bordering on lake Ontario; 913 sq.m.; pop. '91, 241,382. Co. seat, Toronto.

YORK, a river of Virginia, formed by the union of the Pamunkey and Mattapony, flowing s.e. to the Chesapeake bay, nearly opposite Cape Charles. It is 40 m. long, and from 1 to 3 wide. Yorktown, an ancient but decayed port, on the right bank, 11 m. from its mouth, was the scene of Lord Cornwallis's surrender, Oct. 19, 1781.

YORK, a town in York co., Me.; on York harbor, and the York Harbor and Beach railroad; 7 miles n.e. of Portsmouth, N. H. It is a popular summer resort, with a public library, large brick works, national bank, several churches, and weekly newspaper. Pop. '90, 2444.

YORK, city and co. seat of York co., Neb.; on the Burlington route, the Fremont, Elkhorn, and Missouri Valley, and the Kansas City and Omaha railroads; 50 miles w. of Lincoln. It contains York college (Unit. Breth.), Ursuline hospital, public library, electric light plant, several national banks, and daily, weekly, and monthly periodicals. Pop. '90, 3405.

YORK, city and co. seat of York co., Pa.; on the Northern Central, the Pennsylvania, the Western Maryland, and the York Southern railroads; 27 miles s. of Harrisburg. It contains a collegiate institute, young ladies' seminary, co. academy, public schools of all grades, business colleges, hospital and dispensary, Cassat, United, and co. law libraries, Highland and Penn parks, electric light and street railroad plants, nearly a dozen banks, and about 50 churches. The U. S. census of 1890 reported for York, 350 manufacturing establishments, employing $3,842,453 capital and 4120 persons, paying $1,609,456 for wages and $3,170,840 for materials, and having a combined output valued at $5,968,223. The principal manufactures are iron and steel, agricultural implements, wall-paper, cars, organs and pianos, soap, cigars, wire-cloth, underwear, and carriages and wagons. The continental congress held its sessions here in 1777–8. Pop. '90, 20,793.

YORK, the capital of Yorkshire, is situated at the junction of the rivers Ouse and Foss, the three ridings of the county meeting at the same place, and is nearly equidistant from London and Edinburgh. It is the seat of an archbishopric, a county in itself, and a municipal and parliamentary borough. The government is vested in 12 aldermen and 36 councilors, of whom one, as in the case of London, is lord mayor. It returns two members to parliament. The population in '71 was 43,796, being an increase from '61 of 3,363 persons, and 904 inhabited houses. In the registration district of which York is the center, there are 83 parishes, with an area of 82,545 statute acres, and a population in '71 of 64,909. Pop. of municipal bor. '81, 54,198; '91, 66,984.

York is among the most ancient of British cities. Before the Roman invasion it was one of the chief towns of the Brigantes, the most numerous and powerful of the British tribes. It was constituted a Roman station, under the name of *Eboracum*, by Agricola about 79 A.D., and was very soon the principal seat of Roman power in the n., perhaps in Britain. While the Roman dominion existed in the island York was a city of the first importance. Here Hadrian lived and Severus died. Here, too, died Constantine Chlorus, the father of Constantine the Great, and here, as many believe, his greater son was born. When the emperors visited the province York was their chosen residence, and it was the abode of the imperial legates when the emperors were absent. Little is known of the city for a century after the departure of the Romans, about 409 A.D., but it certainly suffered much during the long conflict between the Britons and the Picts, against whose incursions York was a material defense. It afterward became the capital of Northumbria. The first metropolitan church in England was built here by Edwin, the Northumbrian king whom Paulinus baptized; and here also Edgar, the first sole monarch of England, held, in the year 966, the witenagemot. William the Conqueror was long unable to overcome this stronghold of the n., notwithstanding his coronation by its archbishop, Aldred. One Norman garrison, numbering 3,000 men, was put to the sword in 1069, but William exacted a terrible vengeance in the following year, when he laid waste the whole country between York and Durham.

The first English parliament was held at York in 1160 by Henry II., and for 500 years afterward parliaments continued to be summoned occasionally to the ancient city. Under Henry III., the courts of king's bench and exchequer sat at York for seven years; and for a few months Richard II. removed thither the courts of king's bench and chancery. During the insurrections consequent upon the dissolution of the monasteries by Henry VIII., York was seized by the insurgents of the "pilgrimage of grace;" and in its immediate neighborhood, Fairfax, in 1644, conquered prince Rupert on Marston Moor. The city and castle, already besieged, surrendered to the parliamentarians a few weeks after. The British association was organized at Y. in 1831, and here the jubilee meeting was held, 1881.

A city so ancient necessarily presents many interesting memorials of antiquity. There are remains or memorials of Roman towers and temples, and of the earliest British churches. One of the most magnificent of the Anglo-Saxon churches was erected at York in the 8th c., and this, destroyed by fire, rebuilt, enlarged, and changed from time to time, is now known as York minster. A portion of the original church was disinterred during the excavations which followed the latest burning of the minster, in 1829. The present structure takes rank with the finest specimens of Gothic architecture in the world. It was mainly built in the 13th and 14th centuries. Its length, from base to base of the buttresses, is 525 ft., and its extreme breadth 250 ft., being 25 ft. longer than St. Paul's cathedral, and 150 ft. longer than Westminster abbey. The magnificent east window is 78 ft. high and 31 ft. broad, and contains about 200 compartments, each a yard square, representing scriptural subjects. War and fire have conspired to deform or destroy this splendid cathedral. Twice it has been burned down, once in 1069, and again in 1137, each time to rise more beautiful than before. During the times of the commonwealth much damage was done by war and wantonness, and several of its older monuments were mutilated or broken up. In 1829 it was set on fire by Jonathan Martin, a maniac; and the roof of the choir, 222 ft. long, with all the wood-work on each side, was destroyed. While this disaster was being repaired, a workman's candle was carelessly left burning, one night in 1840, and again a terrible fire broke out, destroying the south-western tower, with its splendid peal of bells, and the roof of the nave. The cost of the repairs exceeded £100,000.

A monastery of Benedictine monks was built, or rather completed, at York in the time of William Rufus, which was in great part reconstructed about the end of the 13th century. Its abbot had a miter and a seat in parliament. Some portions of the original building yet remain. Thirteen seceders from this monastery established, in 1131, the neighboring abbey of Fountains, near Ripon, under Cistercian rule. On the site of the Benedictine monastery now stand the museum and gardens of the Yorkshire philosophical society. The same order had a priory dedicated to the holy trinity in Micklegate, and a nunnery outside the walls at Clementhorp. Besides these the Dominicans, Franciscans, Augustinians, and Carmelites had each a monastery, and the Gilbertines a priory, within the city. In the immediate neighborhood were 16 hospitals. At the reformation, York contained 41 parish churches, 17 chapels, 16 hospitals, and 10 religious houses. Twenty-two of the churches yet remain, and several new churches have been built. The Roman Catholics have a fine pro-cathedral. There are numerous dissenting places of worship.

The educational institutions of York are numerous and useful. Notable among them are St. Peter's school, founded in 1557; archbishop Holgate's free school, dating from Henry VIII.; the blue coat school for boys, and the gray coat for girls, supported chiefly by annual subscriptions; and the Yorkshire school for the blind, conducted in a palace originally built for the lord president of the council of the north.

A fine art exhibition was held at York in 1879; the building erected for it contains a concert-hall and picture galleries. The Yorkshire philosophical society was formed in 1822, and possesses a handsome building and gardens on the site of St. Mary's abbey, with a museum, rich in antiquarian relics and specimens illustrative of natural history. Among other public institutions are the county hospital, the first established in England n. of the Trent; the lunatic asylum; the dispensary; the Friends' retreat; and many charitable foundations for the benefit of poor persons. The ancient castle, with the exception of its imposing Clifford's tower, is superseded by the modern and commodious assize courts. The Guildhall, a fine Gothic building, was erected in 1446. There are also convenient assembly and concert rooms, and a creditable theater.

Whatever the trade of York may have been in ancient times—and old writers speak of it in glowing terms—it counts for little now. The making of leathern gloves, combs, glass, etc., supplies employment to many; some find employment in iron-foundries, in flax-spinning, and the manufacture of linen; and of late, the construction of railway carriages has become part of the city industry.—See Drake's *Eboracum;* Browne's *History of the Metropolitan Church of St. Peter's, York;* Britton's *Cathedral Antiquities—York;* Hargrave's *History of York;* Gent's *York;* Wellbeloved's *Eburacum, or York under the Romans.*

YORK, George Frederick Ernest Albert, Duke of, the second son of the Prince of Wales, was born in 1865 and received his training in the navy, but at the death of his elder brother in January, 1892, which made him the heir presumptive to the throne, he gave up active service. In 1893 he married Princess May of Teck and a son was born to them in 1894.

YORK, Henry Benedict Mary, Duke of, cardinal and bishop of Frascati, the last male descendant of the royal house of Stuart, was the second son of James (III. of England), commonly known as the pretender. He was born at Rome, Mar. 26, 1725; and after the failure of the attempt of his elder brother, Charles Edward, in 1745, resolved to enter the church. He was admitted to tonsure and minor orders by Benedict XIV., and created cardinal in 1747. Clement XIII. consecrated him bishop of Corinth *in partibus infidelium,* and afterward of the suburban see of Frascati, where he took up his residence. He also enjoyed, through the favor of the crown of France, the revenues of two abbeys, which he held *in commendam,* as well as a pension from the Spanish court; and the liberal charity with which he dispensed his income among the poor, and for the other charitable and religious necessities of his diocese, endeared him to his flock. These resources were lost at the revolution; but, nevertheless, in the distresses of the holy see which ensued, Cardinal York sold his family jewels for the purpose of relieving Pius VI. in his necessities. On the occupation of Rome he withdrew to Venice; but he returned in 1801, on the restoration of the papal authority under Pius VII. George III., having become aware of the failure of his former means of income, granted him a pension of £4,000 a year, which he accepted, and enjoyed till his death. Those to whom a printed record of the "Last of the Stuarts" may be interesting, will find a small collection of his "pastoral letters," in a 4to volume published in Rome, and entitled *Appendix ad Tusculanam Synodum a Celsitudine Regia Emmentissimi Henrici Episcopi Tusculani* (Rome, 1764). He was appointed by Pius VII. dean of the sacred college, and held several other dignities, and was much respected, as well by the Italians as by foreigners visiting Rome. He died at Frascati, July 17, 1817, at the advanced age of 92. His last will, which is a very interesting document, is printed by Artaud in his *Vie de Pie VII.* His monument, by Canova, in St. Peter's, was erected by order of the prince regent, afterward George IV.

YORK, House of. See Plantagenet.

YORKSHIRE, which is larger in territorial extent than any other two counties in England, is situated nearly in the center of Great Britain, about midway between London and Edinburgh. "Its extreme points," says Allen, in his history of the county, "lie between the parallels of 53° 18′ to 54° 40′ n. lat., and between 2° 40′ of w. to 0° 10′ of e. long. from Greenwich. On the n. side, it is separated, in its whole extent, from the county palatine of Durham by the river Tees; from the mouth of the same river to the entrance of the Humber, the whole e. side is bounded by the German ocean; on the s. side it is divided from Lincolnshire by the rivers Humber and Trent. The boundaries between Yorkshire and the counties of Nottingham, Derby, Cheshire, Lancashire, and Westmoreland are merely conventional, being indicated by no natural feature of the country." The longest diagonal of the county, n.w. to s.e., extends about 130 m.; the shortest, s.w. to n.e., about 90. It contains about 6067 sq. m., or 3,888,351 statute acres. It is divided into three Ridings, North, East, and West, and a small district not included in any of the three, comprising the city of York. The Ridings have areas and

populations, respectively, of 2122 sq. m., 284,827; 1159 sq. m., 141,516; 2658 sq. m., 1,351,570; and the city of York, a co. borough, has an area of 3591 acres, and a pop. of 67,004. In the whole country, besides the archiepiscopal city, there are 59 market-towns, and 1639 townships and places. The North Riding (including for parliamentary purposes the Ainsty and city of York) returns eight members; the East Riding, six members; the West Riding, twenty-two members. According to the census of 1891, the population was 1,844,927.

The history of the county in early times may be mainly read in that of its chief city. Apart from the events which transpired at, and in connection with York, there is little to be recorded. It was originally occupied by the Brigantes, and was subjected by the Romans under Agricola about 71 A.D. When the Roman occupation ceased, it was long and greatly troubled, first by Pictish, and then by Saxon incursions. Under Saxon rule, the traces of Brigantian occupancy were soon obliterated, only the rivers, mountains, and a few remarkable natural curiosities retaining their British names, while all things else received Saxon designations. The county formed part of the kingdom of Northumbria, taking the name of Deira (the country of Deer), when that kingdom was divided. In the troublous times which preceded the conquest, many battles were fought against invading Danes, and generally with success. At Stamford Brig, a few miles from York, Harold, the last of the Anglo-Saxon kings, defeated the united Danish and Norwegian armies, three weeks before he fell before the Normans on the fatal field of Hastings. Among the more notable events of later history, may be named the battle of Wakefield, where the duke of York was defeated by queen Margaret in 1460; the battle of Towton field, near Tadcaster, fought on Palm Sunday in 1461, the most sanguinary conflict of the bitter war between the rival roses; and that of Marston Moor, which gave the final blow to the falling fortunes of Charles I. Since that time, with slight exceptions, the history of Yorkshire has been one of peace and prosperity.

The surface of the county is greatly diversified. On its north-western border runs a range of lofty hills, many of them containing extensive caverns, and giving birth to wild and romantic streams. Here is Ingleborough, 2,373 ft. above the sea-level, with its marvelous cave, half a mile long, full of beautiful stalactites; Whernside, 2,414 ft. high, with its subterranean cataract of 75 ft. in Weathercote cavern; and the vast mass of Mickle Fell, 2,600 ft., which overlooks the waters of the Tees and Lune. Eastward, far away, rise the Hambleton and Cleveland hills. Lower down are the wolds, a line of chalk hills stretching from Flamborough Head to Ferriby on the Humber. The hills and dales of Craven, which cover a large tract of country in the w., abound in natural beauty Right down the center of the county, from the Tees to the Humber, runs the great vale of York. Across its northern border flows the Tees. Coming southward, we find the dales of the Swale, Ure, the Nidd, the Wharfe, the Aire, the Calder, and the Don, all on the western side of the county, each sending a river to the central vale, where the united waters, with the Derwent and a few smaller tributaries from the e., form the Ouse; while the Ouse, after uniting with the Trent, becomes the Humber estuary, which rolls eight-tenths of the Yorkshire waters to the sea. The Ribble, rising in Craven, passes by Preston, and falls into the Irish channel, and is the only Yorkshire river which finds a western outlet. The Esk joins the German Ocean at Whitby, and the Tees between Redcar and Hartlepool.

Geologically, Yorkshire is too large a subject for us to do more than touch The vale of Yorkshire, rarely more than 100 ft. above the sea, has on its western side the long slow elevations which culminate in the Pennine chain, while on the e. rise the lower but more sudden eminences of the wolds and the high grounds of Hambleton and Cleveland. On the w. are the millstone grit and mountain limestone, the two coming together in lofty opposing eminences in many parts of Craven, where, along the line of what is called by geologists the "Craven fault," the limestone rises into magnificent cliffs many hundreds of feet in height, and nearly 2,000 above the level of the sea. The limestone is in many places very rich in lead ore. On the e. lie the chalk wolds. In the southwestern district is a splendid coal-field, intermixed with ironstone, extending over 600 sq. miles.

In the n.w., the lower parts of the North Riding, Craven, and the East Riding, the land mainly supplies occupation to the inhabitants. Craven is almost purely a grazing district, and so are most of the upper lands and dales in the county. Excellent corn is grown in the vales of York and Cleveland, and the East Riding has many large and excellent farms. The horses of Yorkshire, both for the race-course and for use, are too well known to need eulogy. The manufactures of the county are immense. Leeds is the center of the woolen, as Bradford is of the worsted trade. Sheffield is the principal seat of the cutlery manufacture; while the Cleveland district is rapidly rising into importance for mineral wealth and enterprise. The large iron-works of Low Moor, Bowling, and Rotherham, and the flax and linen manufactures of Leeds and Barnsley, merit a passing notice, with the blankets and cloths of the Huddersfield district, and the new llama and alpaca industry introduced at Saltaire near Bingley, by Sir Titus Salt. Harrogate, Ilkley, Askern, and Croft are the principal inland health-resorts of the county; Scarborough, Filey, Bridlington, and Whitby take the lead on the coast.

The public works of Yorkshire rank with the finest in the kingdom. Among them are the Aire and Calder navigation, 15 m. long; the Calder and Hebble navigation; the navigation of the Don and Sheffield region, 40 m.; and the Huddersfield canal, one of the most surprising engineering works in England. This canal is 20 m. in length, and rises between Huddersfield and Marsden by 42 locks to the height of 656 feet. At this elevation, the highest canal-level in the country, it passes by a tunnel more than 3 m. long under Standedge, a range of hills between Marsden and Saddleworth. The canal terminates near Dukinfield. Add to these the Leeds and Liverpool canal—which cost 46 years of labor, and is 129 m. long—besides many smaller but very costly undertakings, and some idea may be formed of the activity of Yorkshire in this direction. Its railway communications are excellent, and grow in number and completeness every year. On these lines, in consequence of the mountainous districts through which many of them pass, are to be found some of the longest and most difficult tunnels, viaducts, bridges, embankments, and cuttings which have yet been attempted by engineers in England.

A very brief reference to the antiquities and natural curiosities of the county must suffice. Traces of great Roman roads are found in many places, as well as of Roman, Saxon, and Danish encampments. In the wolds are many tumuli; and it is supposed by some that the singular and imposing mass of rocks called Brimham crags, which overlook Nidderdale, about 4 m. from Pateley bridge, was once a Druidical temple. The ruins of ancient abbeys and priories are numerous and beautiful. Few can rival the glories of fountains and rievaulx, and the scenery which encompasses Bolton priory is delightful. Besides these there are the ruins of Kirkstall, Roche, and Selby in the West Riding; St. Mary's at York; Jervaux, Byland, and Whitby in the North Riding; and many others. Of castles we may name, in the West Riding, Conisborough castle, near Doncaster, one of the oldest and most interesting ruins known to antiquaries; Knaresborough, Pontefract, and Skipton, the last still used as a residence: in the North Riding, Richmond, with it unrivaled Norman keep ; Middleham Castle, where the king-maker, Warwick, lived, and where Edward IV. was immured ; and Bolton Castle, the prison for a time of Mary Queen of Scots ; in the East Riding, Wressle Castle, once the home of the Percies. Of York castle nothing remains but its massive Clifford's tower.

The lover of the picturesque will find the Yorkshire scenery full of charms. The rapid of Caldron Snout, on the Tees, 200 ft. in descent; High Force, on the same river, a perpendicular fall of 69 ft. over a cliff of greenstone marble; Aysgarth Force and Hardraw Force, on the Ure; the Strid, immortalized by Wordsworth, in Bolton woods on Warfe; the magnificent Gordale Scar and Malham Cove, each nearly 300 ft. in height, on the upper waters of the Aire; and the uncounted glens and streams among its myriad hills are sufficient to indicate the attractions of its river and mountain aspects. It would require a volume to do them justice.—See Allen's *History of the County of York ;* Whitaker's *Histories of Richmondshire, Craven, and Leeds ;* Hunter's *Hallamshire ;* Gent's *York, Ripon, etc. ;* Phillips's *Geology of Yorkshire*, and *Rivers, Mountains, and Sea-coasts of Yorkshire.*

YORKTOWN, town and co. seat of York co., Va.; on the York river, 7 miles from Chesapeake bay. It contains the oldest custom-house in the United States, a monument commemorating the surrender of Lord Cornwallis, and several public schools and churches. The town is chiefly noted for its two sieges, 1781 and 1862. Cornwallis having established himself here Aug. 1, 1781, fortified the town with 7 redoubts and 6 batteries on the land side, and a line of batteries along the river. Gloucester Point, on the opposite side of the river, was also strongly fortified. He had an army of 8000 supported by several vessels anchored in York river. Washington, with the combined French and American army, suddenly leaving New York, reached Williamsburg, and, Sept. 28, marched to the investment of Yorktown with a force of 16,000, of whom 7000 were Frenchmen. A French fleet under Col. de Grasse had one hour before entered the Chesapeake, and, by blocking the James and York rivers, cut off communication between the British at Yorktown and New York. In the siege the French were posted in front. Oct. 9 the batteries opened, dismounting many of the guns and destroying several vessels. On the 11th they began their second parallel, only 300 yards from the fort. On the 14th two redoubts were carried by assault, one by American, the other by French troops. On the 16th the walls and fortifications of the British works were broken down and almost every gun dismounted. The British general attempted now to escape by night by way of Gloucester Point, but the attempt was frustrated by a furious storm, which scattered his boats. On the 19th he capitulated to the allies, the land army with its munitions to the Americans, the marine to the French. The prisoners, exclusive of seamen, amounted to more than 7000, of whom 2000 were sick or wounded. Among the spoils the Americans obtained 235 pieces of cannon, 8000 stand of small arms, 28 regimental colors; the French 2 frigates and 20 transports. The total loss of the British was about 550, and of the allies 300. This victory virtually ended the war. The second siege was begun by McClellan, April 5, 1862. Magruder, with 15,000 men, had erected formidable works around the town, and strong works on Gloucester Point. They were soon re-enforced by Gen. Johnston, the total force numbering 50,000, and that of McClellan about 90,000. In the night of May 3 the confederates left their works and retreated to Richmond. They were pursued, and on the 5th was fought the battle of Williamsburg. Pop. '90, 221.

YORK VON WARTENBURG, Hans David Ludwig, Count, 1759–1830; b. Prussia; entered the army in 1772; was cashiered for insubordination and imprisoned 1780–81, but reinstated in 1786. In the Russian campaign of 1812 he commanded the Prussian contingent in Napoleon's army, and made a convention with the Russians to be neutral. The convention was disavowed by the king of Prussia till he declared war against Napoleon. York distinguished himself in the campaign of 1813–14, and was made field-marshal in 1821.

YORUBA, or Yarriba, a country of Guinea, w. Africa, lying to the e. and n.e. of Dahomey, in n. lat. 6° to 9°, and e. long. 2° to 6°. Its area is about 19,000 sq. m.; and the pop. is estimated at 3,000,000. Palm-oil, cotton, and ivory are the principal articles of export. Lagos (q.v.) is the port through which trade with foreign countries is chiefly carried on. It was a most powerful native kingdom until 1825, when wars broke it up into the smaller divisions which still exist.

YO-SEM'ITE, Yo-Hamité, or Ahwahné, a valley and water-fall of California, in the center of the state, about 57 m. from Coulterville, on a large feeder of the San Joaquin, and on the western side of the Sierra Nevada. The scenery of California is remarkable for its combination of loveliness with sublimity; and in no part of the country yet explored are these characters so strikingly displayed as in the Yosemite valley—a valley about 6 miles in length, and a little more than a mile wide; in some places filled with noble oaks, in others opening out into broad, grassy fields; with a river rushing through it about 40 yards in breadth. Of the pine-covered mountains towering on either side, Cathedral rock is 2,660 ft. high; Sentinel rock, 3,043; Sentinel dome, 4,160; El Capitan presents a squarely-cut and imposing face of rock, rising to 3,300 ft.; the Three Brothers, 3,830; North dome, 3,633; and Half dome, 4,737. Between the latter two lies Mirror lake, the reflections of which are wonderful. The main valley branches at its end into three distinct, but narrow cañons. Little Y. V., about 4 m. long, and from a half to one m. wide, is a continuation of the larger valley. The Yosemite fall has a first vertical leap of 1,500 ft.; the Virgin's Tears fall, a sheer descent of 1,000 ft.; the Pohono, or Bridal Veil waterfall, is remarked for its beauty as well as for its height, which is 930 ft., and almost unbroken. The Yosemite valley was first entered by white men in 1851. See National Parks.

YOUATT, William, 1777–1847; b. England; founded *The Veterinarian* in 1828. He was a veterinary surgeon, among whose works are *The Horse* (1831); *Sheep* (1832); *The Dog* (1842), and *The Pig* (1847).

YOU'GHAL, a seaport, parliamentary, and municipal borough of the barony of Innakilly, county of Cork, Munster, Ireland, situated in lat. 51° 57′ n., long. 7° 52′ w., on the estuary of the Blackwater, 22 m. e. from Cork. The population in 1851 was 7410; in 1861, 6328; in 1871, 6081; in 1881 was 5826, and in 1891 was 4317. The town has some structures of interest—the parish church, which is formed of the nave and aisles of the ancient collegiate church, built by the earl of Desmond in 1464; the "clock-gate;" and Sir Walter Raleigh's house, which remains nearly in its original state. There is a handsome Roman Catholic church, as also churches of the several other denominations; two convents; several schools; a fever hospital, a lying-in hospital, and several other benevolent institutions. The trade of Youghal is considerable, but lies chiefly in the export of agricultural produce. The harbor, which is obstructed by a bar, does not admit vessels of more than 400 or 500 tons burden; the fisheries are extensive and valuable, and employ a considerable number of hands. There are several remains of buildings, civil, ecclesiastical, and military; and according to the local tradition, the potato was first planted at Youghal, by Sir Walter Raleigh.

YOUMANS, Edward Livingstone, b. N. Y., 1821. On account of blindness, from which he only partially recovered in later years, his education was acquired by the aid of his sister (a writer on botany, etc.), who assisted him in his scientific studies. He received a medical degree from the univ. of Vermont, and in 1866 took the chair of chemistry at Antioch coll. He published a *Class-Book of Chemistry*, *The Correlation and Conservation of Forces*, and other books, and was well known as a public lecturer on scientific subjects. He originated the plan of the *International Scientific Series*, of which a large number of volumes has been published, and in 1872 founded the *Popular Science Monthly*, of which he became editor. He d. 1887.

YOUMANS, William Jay, scientist, b. 1838, at Milton, N. Y. He is the brother of Edward Livingstone Youmans. He studied chemistry at Columbia college for a year, spent another in special study at the Sheffield scientific school, and graduated in 1865 from the medical school of the University of the City of New York. After studying physiology and anatomy under Professor Huxley in London and devoting three years to medical practice in Minnesota, he became assistant editor of the *Popular Science Monthly*, and in 1887 was appointed its sole editor. Besides his editorial work on this periodical, he revised his brother's *Class-Book of Chemistry*, and wrote the latter part of an elementary work on physiology and hygiene, published conjointly by himself and Professor Huxley. In 1895 he published *Pioneers of Science in America*.

YOUNG, a co. in n. Texas, about 900 sq. m.; pop. '90, 5049, chiefly of American birth. Co. seat, Graham.

YOUNG, ARTHUR, an eminent writer on agriculture, was born Sept. 7, 1741, and educated at Lavenham in Suffolk. In 1758 he was apprenticed by his father, a doctor of divinity and clergyman of the Church of England, to a mercantile house in Lynn. But Young had no liking for business, and devoted much of his attention to literature. On his father's death, in 1759, he undertook the management of a small farm of which his mother had a lease. Six years afterward he became a farmer on his own account in Essex. He seems, at the same time, to have acted as a parliamentary reporter; and as he only saw his farm from Saturday till Monday, it need not be wondered that he found it unprofitable. At the end of five years he gave £100 to a practical farmer to take the lease off his hands. In the mean time, however, he had made notes of the results of numerous experiments on his farm, which he afterward published, under the title of *A Course of Experimental Agriculture.* His first successful book was *A Tour through the Southern Counties* of England, which was followed by other works describing the state of agriculture in various parts of England and in Ireland. The enthusiasm of Young and his lively style made his writings popular, and by them the knowledge of many judicious practices, confined to one locality, was spread throughout the whole empire. In 1784 Young began the publication of the *Annals of Agriculture,* of which 45 vols. 8vo were published. Three years later he was invited by count de la Rochefoucauld to make a tour in the south of France. What he saw induced him to undertake a series of tours in France, through a great part of which he traveled leisurely on horseback. The result was his most important work, *The Agricultural Survey of France.* The author did not confine his attention to agriculture, but described the social and political condition of the people in a lively and truthful manner, and his work has become, in consequence, the most reliable source of information regarding the state of France just before the revolution. In 1801 the French directory showed the value attached to the writings of Young by ordering the whole of his agricultural works to be translated into French. They were published at Paris, in 20 vols. 8vo, under the title of *Le Cultivateur Anglais.* In 1808 Young received a gold medal from the English board of agriculture, "for long and faithful services in agriculture." He died April 12, 1820.

YOUNG, BRIGHAM, American Mormon leader, was born at Whittingham, Vermont, June 1, 1801, and was the son of a small farmer proprietor. In 1832, having become converted to Mormonism, he was made an elder of the church of the Latter-day Saints, and began to preach at the Mormon settlement at Kirtland, Ohio. In 1835 he was appointed one of the twelve apostles of the church, and sent as a missionary to the New England states, where he was very successful in making converts. After the Mormons had been driven from Kirtland to Missouri, and from the latter to Illinois, and the murder of Joseph Smith by a mob (1844), Young was chosen president in his place. The year following the charter of Nauvoo was repealed by the legislature of Illinois; and after a cannonade of three days the Mormons were driven from their capital and temple, and led by President Young to Utah, where they arrived, after a toilsome journey, July 24, 1847. Next year the great body of Mormons arrived and founded Salt Lake City; and in 1850 President Fillmore appointed Brigham Young governor of the territory for four years. In 1854, in consequence of the Mormons setting the federal laws at defiance by having in 1852 proclaimed polygamy as the "celestial law of marriage," Col. Steptoe was appointed governor in Young's place, but on visiting Utah he thought it an unsafe residence, and resigned. The Mormon president exercised supreme authority, and said, "I am and will be governor, and no power can hinder it until the Lord Almighty says, 'Brigham, you need not be governor any longer.'" In 1857 a new governor, Cumming, was appointed, and sent with a force of 2,500 U.S. troops to protect him and the federal officers; but Young forbade them to enter the territory, and cut off the supply-trains. A compromise was, however, effected, the Mormons pardoned, and the troops remained until 1860. The determination of the United States to abolish polygamy, and the appointment, in 1869, of a new U.S. governor, contributed somewhat to reduce Young's authority. In 1874 his fifteenth wife petitioned the U.S. courts for a divorce, and separated from him. Young died Aug. 29, 1877, leaving a fortune of two million dollars to 17 wives and 56 children. See MORMONS, SALT LAKE CITY, and UTAH.

YOUNG, CHARLES AUGUSTUS, PH.D., LL.D., b. N. H., 1834; graduated at Dartmouth, 1853; till 1856 taught at Phillips academy, Andover, and from 1856 to 1866 was professor of natural philosophy and mathematics in the Western Reserve college, Ohio. In 1865 he was made professor of astronomy and natural philosophy in Dartmouth. In 1877 he was appointed to fill a similar position in the College of New Jersey at Princeton. Prof. Young has made astronomical observations and discoveries of the highest scientific value. In observing the total eclipse of August, 1869, he discovered evidence that the corona is of solar origin, as proved by the bright line of the spectrum. He was a member of Winlock's party of 1870, and observed the total eclipse at Jerez, Spain. In 1872 he was sent out with a coast-survey party by the government, and demonstrated, by observations on the peaks of the Rocky mountains, the superiority of a great altitude for purposes of astronomical observation. He was assistant astronomer in Watson's expedition to Pekin, China, to observe the transit of Venus, 1874. Prof.

Young has published many scientific papers, *The Sun* (1882), and *A Text-book of General Astronomy* (1888).

YOUNG, Edward, the author of the well-known *Night Thoughts*, was born in the year 1684, at Upham, in Hampshire, of which parish his father was at that time rector. He was educated at Winchester school, and afterward, in 1703, went to Oxford. In 1708 a law fellowship in All Souls' college was conferred on him by archbishop Tenison. With law, however, he seems pretty much to have declined to meddle, occupying himself, by preference, with poetry and religious studies. In 1714 he obtained his degree of B.C.L.; and that of D.C.L. followed in 1719. Meantime he had come before the world as a poet, by publishing, in 1713, an *Epistle to George, Lord Lansdowne*, on his being created a peer. For Young, who continued through life one of the most persevering and audacious toadies that ever flattered a patron, this was a characteristic beginning. In the same year he also published two other poems of some length, entitled respectively *The Last Day* and *The Force of Religion, or Vanquished Love;* the year following he again flowed forth in *A Poem on the Death of Queen Anne.* These performances procured him some amount of immediate reputation. In 1719 he ventured on the more ambitious effort of a tragedy, which, under the title of *Busiris*, was brought out at Drury Lane. The piece had a fair success, through which means it probably was that he attracted the notice of the strange and eccentric duke of Wharton, with whom, in the end of that year, he was induced to go for a short time abroad. The duke seems to have entertained for him a real kindness, and to have treated him with much liberality. At the duke's death, Young set forth certain claims against his estates, which he succeeded in making good to the extent of an annuity of £200. The details of the case are perplexed, and need not here be entered into. They involve nothing dishonorable to Young, yet convey a somewhat unpleasing impression that the pious author of the *Night Thoughts*, in his extreme solicitude about the next world, contrived to keep a pretty sharp eye to his little pocket-interests in the present one. In 1721 was produced his tragedy, *The Revenge*, which, though unsuccessful at the time, has since had greater acceptance, and is the only one of his pieces still occasionally acted. His third and last attempt is this field, *The Brothers*, was produced in 1753. Between 1725 and 1728 appeared in succession his satires, under the title of *The Love of Fame, the Universal Passion.* These had a great success, and brought to their fortunate author money as well as fame. They abound with wit and vivacious observation, and even now will very well repay perusal. Of *The Instalment*, a poem, issued in 1726, and addressed to sir Robert Walpole on his being made a knight of the garter, it seems enough to say that, inasmuch as we incidentally hear from Swift of a pension granted him, we may surmise that this was the service to the public by which he had contrived to earn it. In 1727 Young, having taken holy orders for the purpose, was appointed one of the royal chaplains; and in 1730 he became rector of Welwyn, in Hertfordshire. The year after he married lady Elizabeth Lee, daughter of the earl of Lichfield and widow of Col. Lee, He is supposed to have been very happy with her, as he exhibited great grief on her death in 1741. It is believed that from his solemn meditations on the event he got the suggestion of the *Night Thoughts*, begun shortly after, and published 1742–46. By this work almost solely it is that he has continued to be remembered. His mind retained its activity to the last. He published various other works, now so entirely forgotten that it would be waste of time to enumerate them; and in 1762 superintended a collected edition of his works, in 4 vols. 12mo, from which he had the grace to exclude certain of the most fulsome of his dedications, probably as having served their turn and not likely to be of further use. His death took place on April 12, 1765. Since that time his *Night Thoughts* has passed through editions innumerable, and is more or less familiar to every reader. It displays much gloomy force of pious reflection; and has passages of fine imagination, frequently somewhat marred by an epigrammatic mannerism of expression. Certain of its sententious lines have passed into common use and become in a manner proverbial. Though now somewhat declined from the estimation in which he was long held, Young must continue, on the strength of it, to hold a distinct and even high place in that interval in our literature which divides the artificial and so-called classical school of Pope from the return to a simpler and more natural manner, heralded some time afterward by Cowper. If we except his one great weakness of character—an inordinate appetite for preferment and worldly honors, which sought its gratification in ways somewhat servile and unworthy—there seems every reason to believe that Young was, on the whole, a very excellent and worthy man, and sincerely devout Christian.

YOUNG, James, b. Scotland, 1811; for some time assistant in chemistry to Thomas Graham. About 1847 he began a series of analyses of petroleum, and succeeded in producing a lubricating oil for machinery and a lighter oil for lamps. He afterward took out a patent for a process of slow distillation of oil from coal. His discoveries showed the value of coal-oil and petroleum, and contributed to the development of the American oil-wells. He fitted out an expedition in search of Dr. Livingstone in 1872. He d. 1883.

YOUNG, James Hamilton, b. Scotland, 1793; emigrated to the United States in 1801, and settled in Philadelphia. He was an authority on statistical matters as well as an expert engraver, and the Mitchell geographies were his work both in text and maps.

YOUNG, JOHN FREEMAN, S.T.D., b. 1820; graduated at the theol. sem. of Virginia, 1845; was ordained priest in the Prot. Epis. church, Jacksonville, Fla.; engaged in missionary work in Texas; held other charges in the South, and was an asst. minister in Trinity parish, New York. He was consecrated bp. of Fla., 1867. Bp. Young was well known as a liturgical scholar, and in 1864 visited Russia in behalf of the plan to establish intercommunion between the Eastern and the English-speaking Episcopal churches. He d. 1885.

YOUNG, JOHN RUSSELL, b. Chester, Penn., 1841; educated at Philadelphia and New Orleans; began his journalistic career in the former city in connection with the Philadelphia *Press;* became the war correspondent, afterwards the managing editor, of the paper. He also founded the Philadelphia *Evening Star*, a successful penny paper. He was managing editor of the New York *Tribune*, and was for a number of years connected with the *Herald*, accompanying Gen. Grant around the world, as its correspondent. He wrote letters from Europe during the Franco-Prussian war, and has held other journalistic posts of importance. He was appointed by Pres. Arthur, minister plenipotentiary to China, 1882, serving till 1885.

YOUNG, THOMAS, M.D., one of the most ingenious and original philosophers of this century, and almost as eminent for his scholarship and his linguistic discoveries as for his contributions to science, was born at Milverton, in Somersetshire, on June 13, 1773. His parents, Thomas and Sarah Young, were Quakers of the strictest sect; and Young had the impression that the peculiar doctrines of the Quakers had a favorable influence upon his character and career. In particular, he connected with the Quaker doctrine of divine suggestion the perseverance with which he followed up any pursuit in which he engaged, to which he, like Buffon, was disposed to attribute all the discoveries which his genius enabled him to make. Wonderful stories of his youthful precocity have been recorded, and they seem to have more truth in them than such stories usually have. In 1780 he was sent to a boarding-school at Stapleton, near Bristol, where he remained two years; he was afterward put to school at Compton, in Dorsetshire, kept by a Mr. Thompson, who appears to have been an able and judicious teacher. When he left Compton, in his 14th year, besides having a great knowledge, for his age, of Greek and Latin and of mathematics, he had learned French and Italian, and, without any tuition, had made considerable progress in Hebrew, Persic, and Arabic. In 1787 he went to live with Mr. David Barclay, of Youngsbury, near Ware, in Hertfordshire, an eminent member of the society of Friends, partly as the fellow-pupil, partly as the tutor, of that gentleman's grandson, Hudson Gurney. A Mr. Hodgkin was called in to assist the studies of the two lads, but Young soon proved to be superior in acquirements to his instructor, and virtually the three became fellow-students. Mr. Hodgkin published in 1793 a work entitled *Calligraphia Græca*, which he dedicated to Young. Young continued to live with Mr. Barclay till 1792, spending the summer months in Hertfordshire and the winter in London, studying Greek and Latin, the modern languages, the oriental as well as the European, the higher mathematics, and natural philosophy, and, by way of amusement, botany and zoology. He taught himself to write Latin with fluency and elegance, and to write Greek verses, which received the commendation of some of the best judges of the time.

Toward the end of 1792, under the advice of Dr. Brocklesby, an eminent London physician, his mother's uncle, who had been greatly impressed by his abilities and attainments, he began to study medicine, and he attended medical lectures for two years in the schools of London, and afterward for a year at the university of Edinburgh. After going to Edinburgh, Young gave up the Quaker dress and the more inconvenient of the Quaker customs; he took lessons in music and dancing, mixed freely in society, and occasionally went to the theater. These changes, though not intended to go further, eventually led to his complete estrangement from the society of Friends. From Edinburgh he went to the German university of Göttingen, from which, after nine months' residence, he got the degree of doctor of medicine. He continued upward of a year longer in Germany, and visited various medical schools, returning to England in Feb., 1797. At that time the membership of the college of physicians was restricted to graduates of Oxford and Cambridge, and to qualify himself for it Young, on his return, entered as a fellow-commoner at Emmanuel college, Cambridge, at which he remained until he took his degree in 1799. In the year 1800, having become a member of the college of physicians, he took up his residence in London, and began to practice as a physician. He took the degree of M.B. at Cambridge, in 1803, and that of M.D. in 1807.

In 1801 he was appointed professor of natural philosophy, in the Royal Institution, then newly established, and he began to deliver lectures early in the following year. As a lecturer he was not popular, his style being too condensed, and the matter of his lectures unsuited to the miscellaneous audiences of the Royal Institution. He published in 1802 a *Syllabus of a Course of Lectures on Natural and Experimental Philosophy*, in which, among other things, he first announced his great discovery of the law of the interference of light (see INTERFERENCE), which by itself, as sir John Herschel has remarked, would have procured him a scientific immortality. It was this discovery which first fairly turned the balance of evidence in favor of the undulatory as against the molecular theory of light (see UNDULATORY THEORY OF LIGHT). It is Young's most important contribution to science. He had been elected a fellow of the Royal Society as soon as

he was 21; in 1802 he became its foreign secretary, a post which he retained till the end of his life. He resigned his professorship on his marriage, in 1804, fearing that his filling a chair of science might interfere with his success as a physician. The lectures which he delivered as professor were the foundation of the *Course of Lectures on Natural and Mechanical Philosophy*, which he published in 1807—a great work, embodying a complete system of natural and mechanical philosophy, on which he was engaged for nearly five years. A new edition of these lectures was published in 1845, edited by prof. Kelland of Edinburgh. Young's doctrine of interference was at first unfavorably received by scientific men in England. it was attacked and ridiculed in the *Edinburgh Review*, and so little interest was taken in the subject, that of a pamphlet which Young published in answer to the *Edinburgh Review*, only a single copy was sold. As has often happened, the first recognition of the importance and ingenuity of this and others of Young's speculations came from the scientific men of the continent.

Young was admitted as a fellow of the college of physicians in 1808, and was elected one of the physicians of St. George's hospital in 1810. He afterward published several medical works, which, though they were little more than compilations, and are now forgotten, show that he was thoroughly versed in the history of diseases and of medical opinion. His hospital practice, too, is said to have been successful, but he had but little success in getting patients. He retired from practice—retaining, however, his connection with St. George's hospital—in 1818, on his appointment to be secretary of the board of longitude. On the dissolution of the board of longitude, he became the sole conductor of the *Nautical Almanac*, and afterward, when the system of life-insurance began to be popular, he held, along with this post, the office of scientific adviser of a life insurance company. During the last years of his life, he was a member of a council appointed to advise the admiralty in scientific matters.

Young's greatest achievement after his great discovery of the law of interference, was made in connection with the subject of hieroglyphics (q.v.). He was the first to hit upon the process of investigation by means of which the received interpretation of hieroglyphics has been arrived at. His discovery, originally published in papers written for the society of literature, and afterward in the *Encyclopædia Britannica*, was given to the world in a book in 1823. In his later years much of his attention was given to this and cognate subjects. He was engaged on an Egyptian dictionary at the time of his death. His miscellaneous writings, contributions to the transactions of learned and scientific bodies, to reviews, and the *Encyclopædia Britannica*, were very numerous. Three volumes of them, two consisting of scientific papers, edited by Dean Peacock, the third of hieroglyphical essays and correspondence, edited by John Leitch, were published in 1855.

He died after several months of failing health, and a short period of severe illness, on May 10, 1829.

YOUNG ITALY was a name given early in the present century to an association of Italian refugees who established themselves in Marseilles, France. The association was formed in 1831, mainly at the instigation of Mazzini, and had for its principal object the establishment of a republic. Young Italy is a term now used in referring to the party in Italian politics which favors Irredentism (q.v.).

YOUNG MEN'S CHRISTIAN ASSOCIATIONS. George Williams first organized one in London, 1844, since which, similar associations, to the number of over 5000, have been formed in various countries of the world. The first one formed in America was in Montreal, in 1851, and their increase has been greater in this country than in Europe. The number in the United States and Canada in 1896 was 1455, with a membership of over 263,298. An international convention was formed of the associations of the United States and Canada in 1854. There have been ten conferences of associations of all lands. Though instituted and largely controlled by members of evangelical churches, young men of good moral character are received as associate members, enjoying the privileges of full members, but not voting. In these associations it is sought by various agencies, as reading-rooms, lectures, libraries, classes of secular instruction, gymnasia, employment bureaus, as well as by Bible classes, prayer-meetings, etc., to promote the interests, secular, moral, and religious, of young men. Women's Christian associations were introduced in New York in 1857, in Boston, 1866, and there were in 1896 in the United States and Canada 345, with about 35,000 members, of which many had boarding-houses for young women, industrial schools, and libraries, while many assist in finding employment, conduct Bible classes, etc.

YOUNGSTOWN, city and co. seat of Mahoning co., O.; on the Mahoning river, and the Erie, the Lake Shore and Michigan Southern, the Pittsburg and Lake Erie, the Pittsburg and Western and the Pennsylvania Co.'s railroads; 69 miles s.e. of Cleveland. It contains a U. S. government building, Y. M. C. A. building, city hospital, public library, Wick, Central, and Mill Creek parks, Rayen high and preparatory school, electric light and street railroad plants, waterworks supplied from the river, several national and savings banks, and about 50 churches. There are large iron and rolling mills, blast furnaces, foundries and machine shops, bridge and car works, breweries, tin and terne plate works, etc. Pop. '90, 33,220.

YPRES, or YPEREN, a t. of Belgium, formerly fortified, in the province of West Flanders, is situated in a fertile plain on both sides of the Yperlee, about 29 m. s.s.w. of Bruges (53 by railway). The marshes around the town at one time rendered it very unhealthy, but considerable improvement has been effected in this respect by drainage. Ypres was at one time one of the most important manufacturing towns in Flanders, the

number of inhabitants in the 14th c. being 200,000, and the number of looms 4,000. Its staple manufacture consisted of the cloth called, according to some, after the name of the town, diaper. The only remnant of its once flourishing manufacture is the Cloth-hall (*les Halles*), standing in the great market-place, a building of prodigious size, in the form of a trapezium, in a rich style of Gothic architecture, and surmounted by a stately square tower or belfry, with a clock and chimes. It was begun in 1230, and continued till 1342; the e. end, supported on pillars, being added in 1730. One of the wings is now used as the *hôtel-de-ville*, and other parts are occupied by different public establishments and concert-rooms. The cathedral of St. Martin is a fine Gothic edifice, with an altar of Carrara marble, a richly carved pulpit, and a picture doubtfully attributed to Van Eyck. Other buildings are the churches of St. Peter, St. James, and St. Nicolas, the old castle-ward, two colleges, several hospitals, barracks, numerous boarding and day schools, etc. The chief modern manufactures are thread, lace, linens, woolens, cottons, silk, ribbons, leather, oil, soap, tobacco. There are many tanneries, oil-mills, salt-works, dye-works, breweries. The town is connected with the Yser by canal, and is a station on the West Flanders railway. Pop. '90, 16,505.

Ypres is a very old town, its origin dating from the 9th and 10th centuries. In 1688 it was strongly fortified by Louis XIV., and in the great European wars was frequently subject to sieges.

YPSILANTI, a city in Washtenaw co., Mich., on the Huron river, and the Lake Shore and Michigan Southern and the Michigan Central railroads; 30 miles w. of Detroit. It contains the Michigan state normal school, business college, ladies' public library, electric light and street railroad plants, waterworks supplied from springs, and national and savings banks, and has manufactories of woolen goods, paper, machinery, dress stays, condiments, etc. Pop. '90, 6129.

YPSILANTI, a Fanariot family, which falsely pretends to be descended from the imperial stock of the Comneni, has furnished various champions of the Christian population under Turkish rule. The first of these, PRINCE CONSTANTINE YPSILANTI, was born in 1760 at Constantinople, and for his translation of the works of Vauban, was raised to high official rank by sultan Selim III., and was subsequently appointed hospodar of Moldavia in 1799, and of Walachia in 1802. His administration of the government of these provinces was marked by wisdom and energy; but his ill-concealed sympathies with Russia led (1806) to his dismissal and flight to Transylvania. Re-established in the government of Walachia by the Russians, he showed his hatred for the Porte by inciting (1807) the Servians to insurrection; but finding soon after that his allies the Russians had views and aims quite inconsistent with his, and unable to strive with both Russians and Turks, he took the oath of allegiance to the czar, and retired to Kiev, where he died July 28, 1816. He has left numerous works, composed in Italian, French, and Turkish.

His three sons, Alexander, Demetrius, and Nicolas, followed up the same course of policy. The eldest, ALEXANDER, born in 1783, served for some time in the Russian army, and was chosen by the "Hetairists" as their chief in 1820. In promotion of the cause of Rouman independence, he collected a large sum by subscription in Russia, and afterward invading Moldavia, succeeded in raising an insurrection in both principalities. But, little suited by natural gifts to guide the movement he had originated, he was attacked by the Turks near Galatz, totally defeated, and forced to take refuge in Austria, where he was arrested and imprisoned. Released after a time, but broken in spirit by chagrin and privations, he retired to Vienna, where he died Jan. 31, 1828.—His younger brother, DEMETRIUS, who was born Dec. 25, 1793, also commenced his career in the Russian army, and joined his brother in his schemes for emancipating from servitude the Christian population of Turkey. Sent to Greece, armed with powers from his brother, he took a glorious part in the capture of Tripolitza (Oct., 1820), but was less successful in the following year in his attack on Eubœa. His gallant defense of Argos against the Turks, stopped the victorious march of the latter, and gained (1823) for him the honorary titles of president of Argos, prince of the Peloponnesus, president of the legislative council, and senator. His stubborn resistance (1825) to the victorious Ibrahim at Napoli was another valuable service to Greece. In 1827, the grateful Hellenes made him commander-in-chief of their forces; but some difference arising between him and the president, Capo d'Istria, he resigned his post in Jan., 1830. He died at Napoli di Romania, Aug. 16, 1832. Ypsilanti was insignificant in appearance; and was as deaf to the allurements of pleasure as to the promptings of ambition.

YSAYE, EUGÈNE, violinist, b. in Belgium 1858, studied at the conservatory of Liège and at Brussels, and soon acquired a great reputation as a successful performer. In 1886 he became a professor in the royal conservatory at Brussels, and in 1894 visited the United States, where he achieved great success. In 1897 he again visited the United States.

YSSEL, or IJSSEL, a river of the Netherlands, formed by the junction at Doesburg, in Gueldres, of the Oude (*Old*) Yssel from Westphalia and the new Yssel, an offset of the Rhine, cut by Drusus. After this it flows n. and latterly n.w. past Zutphen and Deventer, forming part of the boundary between Gueldres and Oberyssel, and, passing Kampen, falls into the Zuyder Zee, after a course of about 80 m., forming at its mouth a delta, which is gradually increasing. The principal affluents are the Borket, the Schipbeek, and the Grift.—There is another river of the same name, a branch of the Rhine, in the province of Utrecht.

Y'STAD, a seaport t. in the extreme s. of Sweden, on the Baltic, in the län of Malmöhus, and about 34 m. e.s.e. of Malmö. The town is well built, and has a handsome market-place, churches, a town-house, barracks, etc. There is a good harbor, and a brisk and improving trade is carried on, steamers plying to Stockholm, Lübeck, Kalmar, Stettin, Stralsund, and Copenhagen putting in here. Pop. '93, 8540.

YT'TRIUM is a very rare metal, whose oxide is the earth of *yttria*, which is found in the Scandinavian mineral *gadenolite* (a silicate of yttria, glucina, and an oxide of cerium and iron), in *yttrotantalite*, and in one or two other very scarce minerals. Neither the metal, the oxide, nor the salts of the oxide are of any practical importance. According to Mosander, three bases have been confounded under the single name of yttria; to the most abundant of these he gives the name *yttria*, while he distinguishes the others as *erbia* and *terbia*.

YUBA, a co. in n.e. California, bounded s. by Bear river; about 714 sq.m.; pop. '90, 9636. Gold and silver are found. Co. seat, Marysville.

YUCATAN. See MEXICO.

YUC'CA, a genus of plants of the natural order *liliaceæ*, natives of North and South America, and some of which are often cultivated in gardens on account of the singularity and splendor of their appearance. *Y. gloriosa* is a native of Virginia and of more southern parts of North America, but is hardy in the northern states. Its stem is 2 or 3 ft. high, the upper part of which produces a great tuft or crown of large sword-shaped evergreen leaves, each terminating in a sharp black spine. From the center of this crown of leaves arises the flower stalk, of 3 ft. or upward in height, branching out on every side so as to form a great panicle. The flowers are bell-shaped and drooping, white with a purple stripe on the outside of each segment of the perianth. The fibers of the leaves are used by the American Indians to make a sort of cloth and cordage.—The other species have a general resemblance to this in habit and appearance. The fiber of the *yuccas* is similar to that of the *agaves* and *bromelias*, and probably is often included under the name *pita flax* or *pita fiber*.

YUDHISHT'HIRA. See PÂN'D'AVAS.

YUGA (from the Sanskrit *yuj*, join; kindred to the Lat. *jung-*, the Gr. *zeug-*, Gothic, *juk;* hence, literally, junction) denotes, in Hindu mythology and astronomy, a long mundane period of years, which is preceded by a period called *Sandhyâ*, "twilight," and followed by a similar period called *Sandhyâm's'a*, "portion of twilight." Manu, the Mahâbhârata, and the Purân'as name four such periods, three of which have already elapsed—viz, the *Kr'ita-*, *Tretâ-*, and *Dwâpara-Yuga;* while the fourth, or *Kali-Yuga*, is that in which we live. The Kr'ita-Yuga, according to these works, consists of 4,000 divine years, its Sandhy'â of 400, and its Sandhyâm's'a likewise of 400 divine years. The Tretâ-Yuga consists of 3,000, and its Sandhyâ and Sandhyâm's'a of 300 divine years each; the Dwâpara-Yuga of 2,000 divine years, with 200 such years to its Sandhyâ, and 200 to its Sandhyâm's'a; and the Kali-Yuga of 1000 divine years, with 100 such years to its Sandhyâ, and 100 to its Sandhyâm's'a. And since a divine year comprises 360 solar years of mortals, a year of men being a day of the gods, these Yugas, with their Sandhyâs and Sandhyâm's'as, would severally represent 1,728,000, 1,296,000, 864,000, and 432,000, or in the aggregate, 4,320,000 solar years of mortals—a period called Mahâyuga, or "a great Yuga;" 4,320,000,000 years being a day and night of Brahmâ. See KALPA. The notion on which the theory of these Yugas and their Sandhyâs and Sandhyâm's'as is based, as may be easily inferred from the foregoing statement, is that of a descending progression, 4, 3, 2, 1, each of these units multiplied by 1000, and in the case of the periods preceding and following the Yuga by 100 years. The deteriorating process thus indicated in the succession of these Yugas, is also supposed to characterize the relative physical and moral worth of these mundane ages. "In the Kr'ita-Yuga," Manu says, "men are free from disease, attain all the objects of their desires, and live 400 years; but in the Tretâ and the succeeding Yugas, their life is lessened gradually by one quarter." . . . "In the Kr'ita-Yuga, devotion is declared to be the highest object of men; in the Tretâ, spiritual knowledge; in the Dwâpara, sacrifice; in the Kali, liberality alone." See also for other passages the article KALIYUGA. The present or Kaliyuga of the world commenced in the year 3101 B.C., when in the year 1867, therefore, 4,968 years of the Kaliyuga would have expired.—The term Yuga is sometimes also applied to other divisions of time. The Vishn'u-Purân'a, for instance, mentions, besides the Yugas above named, a Yuga which consists of a cycle of five years, called *Sam'vatsara, Parivatsara, Idvatsara, Anuvatsara*, and *Vatsara* (see Wilson's translation of this Purân'a, 2d ed., by Fitzedward Hall, vol. i. p. 49, ff.; vol. ii. p. 254, ff.); and a Yuga, or cycle of five years, is, as Colebrooke states (*Miscellaneous Essays*, vol. i. p. 106, ff.), likewise the cycle described in the astronomical treatises connected with the Vedas. The use of the term Yuga, however, in such a special sense is not frequent, whereas its application to the four mundane ages is that which generally prevails in the classical and mediæval Sanskrit literature.—For other works, besides those already referred to, which afford information on these and other divisions of Hindu time, see *Kala Sankalita, a Collection*

of Memoirs on the Various Modes according to which the Nations of the Southern Parts of India divide Time, etc., by John Warren (Madras, 1825); and *Carnatic Chronology, the Hindu and Mohammedan Methods of Reckoning Time Explained*, etc., by Charles Philip Brown (Lond. 1863).

YUKON RIVER. See ALASKA.

YULE, the old name (still in provincial popular use) for Christmas. It points to heathen times, and to the annual festival held by the northern nations at the winter solstice as a part of their system of sun or nature worship. In the Edda, the sun is styled *fagrahvel* (fair or shining wheel); and a remnant of his worship, under the image of a fire-wheel, survived in Europe as late at least as 1823. The inhabitants of the village of Konz, on the Moselle, were in the habit, on St. John's eve, of taking a great wheel wrapped in straw to the top of a neighboring eminence, and making it roll down the hill, flaming all the way: if it reached the Moselle before being extinct, a good vintage was anticipated. A similar usage existed at Trier (see Grimm, *Deutsche Mythologie*, p. 586). The old Norse *hvel*, Ang.-Sax. *hveol*, have developed into Icel. *hiol*, Swed. and Dan. *hjul*, Eng. *wheel;* but from the same root would seem to have sprung old Norse *jol*, Swed. and Dan. *jul*, Ang.-Sax. *geol*, Eng. *yule*,* applied as the name of the winter solstice, either in reference to the conception of the sun himself as a wheel, or, more probably, to his wheeling or turning back at that time in his path in the heavens. Goth. *hveila*, Eng. *while*, denote time as wheeling or revolving. The general nature of the festival, and the way in which the observances were overlaid, or transformed and masked by the Christian institution, are noticed under the head of CHRISTMAS. In the greenery with which we still deck our houses and temples of worship, and in the Christmas trees laden with gifts, we perhaps see a relic of the symbols by which our heathen forefathers signified their faith in the power of the returning sun to clothe the earth again with green, and hang new fruit on the trees; and the furmety still or lately eaten on Christmas eve or morning in many parts of England (in Scotland, the preparation of oatmeal called *sowans* is used) seems to be a lingering memory of the offerings paid to Hulda or Berchta (q.v.), the divine mother, the northern Ceres, or personification of fruitfulness, to whom they looked for new stores of grain. The burning of the *yule-log* (or *yule-clog*) testifies to the use of fire in the worship of the sun (see BELTEIN).

YUMA, a co. in extreme s.w. Arizona, bounded s. by Mexico, w. by the Colorado river; about 10,136 sq.m.; pop. '90, 2671. Co. seat, Yuma.

YUMA, a co. in n. eastern Col., on the Nebraska border, formed 1889 from part of Washington; about 1180 sq.m.; pop. '90, 2596. It is drained by the north fork of Republican river. Co. seat, Yuma.

YUMAS, a tribe of American Indians on both banks of the Colorado river, near its junction with the Gila. The Spanish began settlements and missions among them in 1780, but the next year the Yumas massacred them. The number of the tribe was 3,000 in 1791, and is now only about 900. They are also known as the Cuchans. With some other tribes they were given a reservation of 200 sq.m. in 1865.

YUNG WING, b. near Macao, China, 1828, of humble, worthy parents; entered at 8 years of age the mission-school of Mrs. Gutzlaff; later, the Morrison school under the Rev. S. R. Brown of America, and was by him brought to America in 1847. In the family of Dr. Brown's mother he became a Christian, and forthwith devoted his life to the welfare of China. He graduated at Yale college, 1854, having excelled in mathematics, metaphysics, and English composition. While there, he conceived a plan for having Chinese youth of promise brought to America for education. He returned, reaching China, 1855, a stranger, without money or influential friends, the language nearly forgotten, but with the aim to reach the imperial ear. For 16 years he studied, taught, served the government, acquired rank, and won to his views officers high in authority. In 1871 his plan was adopted by government, and the sum of $1,500,000 granted. He was made chief commissioner of the Chinese educational mission, and then placed 112 selected Chinese young men under a 15 years' course of instruction in this country. He is now a mandarin of the second grade, intendent of the province of Kiang-Su; and was for a while associate minister to the United States.

YUNX, a genus of birds of the woodpecker family, a species of which, *yunx torquilla*, is called wryneck (q.v.). The *Y. torquilla* is the *iunx* of the Greeks. Aristotle has well described it and its long tongue, and the power of protruding and retracting it, as well as the writhing motion of its neck. It has been made familiar to readers of Greek by the adjuration in the second idyl of Theocritus (*Pharmaceutria*). The wryneck is the torcol, tercon, turcot, and torcot of the French; the torcicollo, collatorto, capertorto, vertilla, and formicula of the Italians; gjoktyta of the Swedes; natterwindl, wendhals, and drehals of the Germans; long-tongue, emmet-hunter, snake-bird, cuckoo's mate, cuckoo-maid, and cuckoo-fool of the English; gwddfdro of the Welsh, and arizui of the Japanese.

YUTHIA, often written Ayuthia, the ancient capital of Siam, is on an island formed by two arms of the river Menam, 54 m. above Bangkok. It was once a vast city, and

* In one of the Frisian dialects, *jule* or *jole* is used to signify a wheel,

contained immense buildings gorgeously ornamented. In 1767 the Burmans invaded Siam, and destroyed the city. It was rebuilt, and contains 40,000 inhabitants.

YVERDUN′, a t. on lake Neufchâtel, in the canton of Vaud, Switzerland, 20 m. n. of Lausanne; pop. '88, 6330. It is the Ebrodunum of the Romans.

YVETOT, an old t. of France, in the department of Seine-Inférieure, is situated on an elevated and fertile plain, 32 m. n.e. from Havre, and 23 n.w. from Rouen by railway. The houses are mostly of wood, roofed with slates, the principal street being upward of 2 m. long; there is a well-planted promenade, but the town contains few objects of interest. There are manufactures of linen, cotton, calico, and velvet, and a considerable trade in cattle and agricultural produce. Pop. '91, 7617. The lord of Yvetot is styled "roi d'Yvetot" in old chronicles, as the town and territory was long (till 1681) a principality. There is a tradition that Clotaire, son of Clovis, having slain one Gaulthier, lord of Yvetot, before the high altar of Soissons, endeavored to make atonement for the sacrilegious deed by conferring the title of king on the heirs of Gaulthier.

YVON′, Adolphe, b. Lorraine, 1817; studied painting under Paul Delaroche. He spent several years in Russia, and many of his historical pictures are of Russian events. His most noted work is the "Capture of the Malakhoff," 1857, executed on the spot. Other well-known historical works are: "The Battle of Solferino," and "Magenta," and "The First Consul Descending the Alps." M. Yvon has also been very successful in *genre* painting and portraiture.

Z

Z, THE last letter of the English and other west European alphabets, had no place in the original Latin alphabet, but was adopted in the time of Cicero from the Greek along with *y* (v), and thus stood last. In Greek it had the sixth place, and had the power of a double consonant, being equivalent to *ds* or *sd;* in Latin its use was confined to words of Greek origin. In High-Ger., in which it is pronounced like *ts*, it corresponds to *t* in the Low-Germanic and the Scandinavian tongues, e.g., *zeit* = Eng. *tide* (time). In Ital. *z* or *zz* mostly takes the place of the Lat. *ti*, as in *negozio* = *negotium*, *palazzo* = *palatium*, and is pronounced *ts*, or, preceded by *n*, *ds*. In Eng. and in Fr. it represents the flat sibilant sound of which *s* is the sharp. But in Eng., as in the vast majority of cases, *s* has always been employed to represent the flat sibilant sound as well as the sharp (e.g., in almost all plurals, as *bones, cards*, in words like *revise*, etc.), there is a tendency to drop the use of *z*, except in a few individual words, such as *size, prize*. Many maintain the use of *z* in words derived from the Greek, especially from verbs in *izō*, as *baptize*, and also in words formed on the analogy of these, as *legalize;* but even the advocates of this rule do not act on it consistently, and the mere English scholar is fairly puzzled. This is one of the points of English orthography most urgently calling for reform.

ZAANDAM′ or **SAARDAM**, a t. in the province of North Holland, Netherlands, is situated on both banks of the Zaan, at its entrance into the Ij (a deep and narrow bay of the Zuider Zee). Zaandam lies 5 m. n.w. of Amsterdam on the other side of the bay. In former times shipbuilding was largely carried on, but has nearly ceased. The whale-fishing, which, in 1701, employed 35 ships, has been abandoned. There is still a considerable shipping trade. The principal industries are sawing wood, preparing vegetable oil—chiefly from colza—manufacturing paper, grinding grain, mustard, dye-stuffs, snuff, etc., making starch, rope-spinning, and iron-founding. At a distance the town looks like a forest of windmills. Zaandam is a pleasant place, and many of the inhabitants are reputed to be wealthy. In 1697 Peter the Great worked in one of the shipbuilding yards as a carpenter, and the house in which he lived is carefully preserved. It was visited in 1814 by the emperor Alexander of Russia, and is now inclosed with another building, to prevent exposure to the weather. There are two Dutch reformed churches, one Lutheran, two Baptist, and two Roman Catholic churches, a Jewish synagogue, and several institutions for orphans and old people. Two public schools, a school of design, and two poor schools are maintained by the town. Pop. '90, 15,604.

ZABERN (the Roman *tabernæ*, tavern) is the name of three German towns on the w. side of the Upper Rhine, one of which was French till 1870. The first two are in the palatinate (Rhenish Bavaria)—viz., Berg-Zabern, a town of about 3,000 inhabitants, on the Erlenbach, occupied chiefly with agriculture and some small manufactures; and Rhein-Zabern, about 4 m. further e., on the same stream, with little more than 2,000 inhabitants, noted for the two battles fought there and at the village of Jokgrin, about 2 m. further s., between the Austrians and the French, June 29 and Aug. 20, 1793.

The other, which, to distinguish it from these, is called Alsace-Zabern (French *Saverne*), till the war of 1870 in the French department Bas Rhin, is now capital of a circle in the German imperial territory Alsace-Lorraine. It is situated on the Zorn, which flows into the Rhine, on the Paris and Strasburg railway and highway, and also on the Marne and Rhine canal. The to..n contains a palace and college, and had in 1890, 7341 inhabitants, employed in making cloth, pottery, leather, and hardware, and in the transport of wood, from the Vosges mountains. It belonged in the 12th c. to the bishops of Metz, and afterward to those of Strasburg. There are still some Roman antiquities in the college. In 1696 the fortifications were razed. The stately palace was rebuilt by cardinal Louis de Rohan, famous in the story of the Diamond Necklace (q.v.); it served in 1817 and 1818 as barracks for the Austrian army of occupation; in 1852 it became a home for the widows and daughters of the members of the legion of honor; and now it is again a barrack. The surrounding scenery is rich in ruins and picturesque effects. A spiral walk, called the Zabern path, about 9 m. long, leads, with many windings and 17 covered bridges, to the top of the Vosges, from which the spectator looks down on Alsace as a garden. The pass of Zabern, or Saverne, which divides the Upper and Lower Vosges, is only 1325 ft. high. The railway, the canal, the Zorn, and highway, all run side by side along the charming valley; and there is a constant succession of bridges, embankments, viaducts, and tunnels throughout the 45 minutes' journey from Zabern to Saarbourg.

ZA'BISM. In the article on Sabæans (q.v.), we spoke chiefly of certain inhabitants of Arabia Felix, the "Sabaioi" of the Greeks, or "Sabæi" of the Romans. It appears that this name was, in the 4th c. A.D., superseded by that of Himyarites, and belonged to many tribes, that derived their descent from one Sabâ ("a descendant of Eber, or descendant of Noah"), who also was called Abd Shemesh—Servant of the Sun. These Sabæans, who considered themselves pure autochthons, in contradistinction to the immigrated tribes, have often been confounded with a number of other peoples of antiquity, and with professors of many forms of religious belief and speculation; in fact, the confusion that has sprung out of the unwieldy mass of information found respecting these many varieties, and which has been hopelessly mixed up by many generations of orientalists and theologians, is almost without parallel. We shall not here survey the manifold systems and theories that have been evolved from time to time, and handed down carefully, but we shall rather—in the main following Dr. Chwolson—enumerate the principal stages of Zabism as it appears, considered as a religious phase of mankind. We must premise that we exclude at once those imaginary Zabians who were taken by the mediæval Arabic, Jewish, and Persian writers to be identical with heathen or star-worshipers, as well as those who, like the ancient Chaldeans, the ante-Zoroastrian Persians, the Buddhists, etc., were vaguely called by that name by Mohammedan and other writers of the 12th century. These writers all start from the notion that idolatry, star-worship, and Sabæism were identical, and they called nearly all those who were neither Jews or Christians, nor Mohammedans or Magians, heathens or Sabæans. Zabism had then become, like Hellenism, from being a *nomen gentile*, an appellative. Confining ourselves to historical Zabism, we have to distinguish (1) the Chaldean Zabians of the Koran. These are the "Parsified" Chaldee heathens or non-Christian Gnostics—the ancestors of the present Mendaites, or so-called Joannes Christians, who live not far from the Persian gulf, and speak a corrupt kind of Chaldee-Aramaic; and (2) the Pseudo-Zabians, or Syrian Zabians (in Harran, Edessa, Rakkah, Bagdad), or, since 830–831 A.D., remnants of the ancient Syrian but Hellenized heathens. These disappear (as Zabians) since the 12th c., but perhaps still exist, under some other name, in Mesopotamia. It is those Pseudo-Zabians who spoke the most refined Syro-Aramæan dialect. They form the chief representatives of Zabism emphatically deserving of the name. The first-named, or Chaldean (Babylonian) Zabians, who transferred that name to the Harranic Zabians, and were of great influence upon the development of these latter's peculiar speculations, are the people meant under that designation by the Koran, and by the Mohammedans of this day. They are, as we said, also known as Christians of St. John, or Mendaïtes. Among the Nabathean heathens of the n.e. of Arabia and the extreme s. of Mesopotamia, near Wasith and Bassra, there arose, in the last decennium of the 1st c. A.D. a man named Elxai (Elchasai = Scythianus), born in the n.e. of Parthia (probably an adherent of Zoroastrianism, perhaps also acquainted with Buddhism), and spread among them Parsee ideas and Parsee religious rites and customs. They called themselves Mendaïtes —i.e., Gnostics. Many of their religious legends and tales they adopted at a later period from their Jewish and Mohammedan neighbors—chiefly, it is presumed, with a view of making themselves less hated by the ruling Mohammedan powers. They received the name of Ssabiin from their constant washings, and purifications and baptisms. Their Arabic neighbors occasionally translated this word into the Arabic Al-Mogtasilah, "those who wash themselves." About a hundred years after the foundation of this sect by Elchasai, Manes was born of Mendaïte parents, and was brought up among the Mendaïtes. He remained faithful to this creed up to his 24th year, at which period he founded the new sect of Manichæans (q.v.), which did not at first depart so considerably from Mendaïsm as it did at a later period (see MANICHÆANS). To these aboriginal Zabians there succeeded, in 830 A.D., a totally different kind of sect under the same name—viz., the

Harranian Syrians. They themselves derived their denomination from one Zâbî, who is variously called a son of Seth, son of Adam, or a son of Enoch or Idris, or a son of Methuselah, or of some fictitious Badi or Mari, a supposed companion of Abraham; while the Mohammedan writers, who, like the Greeks, endeavor to derive everything from their native tongue, either declare it to be derived from *ssaba*, "to turn, to move," because they turned to the paths of untruth, instead of that of the true religion—i.e., Islam; or, as the Zabians themselves sometimes explain it, "because they have turned *to* the proper faith." Another Arabic derivation makes them take their name, still more absurdly, from a root *ssabaa* = to fall away from the proper religion, or to turn one's head heavenward—i.e., for the purpose of worshiping the angels and the stars, etc. European scholars have for the most part followed either Brooke or Scaliger, who variously hold the name to have sprung either from an Arabic root, which would point to their having come from the "east," or, again, from the Hebrew word for "host," viz., of heaven, which they were supposed to worship. The real state of the case, however, is that, whatever, the derivation of the name, it did not originally belong to the Harranians, as we have stated already, but was assumed by them, for the purpose of evading the Mohammedan persecutions, from the people mentioned in the Koran.

But it is by no means easy to say who these so-disguised Harranians really were, and what, since it was neither Judaism, nor Christianity, nor Mohammedanism, nor Magism, their religion really consisted of. Former investigators mostly took them to have been a distinct race and people, and their religion to have been composed of Chaldaism, Parsism, Judaism, Christianity, Neoplatonism, Gnosticism, and cabbalistic speculations. This, however, is far from being the fact. Broadly speaking, they might perhaps best be described as Syrians, who, partly descended from Greek colonists, had been subject so long to Syrian influences that they became in a manner Syrianized. Their religion was heathenism, the old heathenism of their Syrian fathers, which had, with incredible obstinacy, resisted not only Christianity, but rendered even Mohammedan ill-will harmless by stratagem. There can, however, be no doubt about certain foreign non-pagan elements having crept into it during the early Christian centuries. Eclecticism prevailed at that period, and it was not only Greeks and Romans that found the influence of foreign, chiefly eastern, metaphysical speculation irresistible. But apart from that peculiar syncretism, we find many other new additions to Harran idolatry in the shape of Zabism. There are, first of all, a certain number of legends about biblical personages from whom they pretend to be descendants—legends which, it may be presumed, they only, for the nonce, permitted to belong to their sacred traditions. There are further a number of laws of purity and impurity, and of sacrifices, which strongly remind of Judaism. Again, names of Greek and Roman gods, such as Helios, Ares, and Kronos, occur, a circumstance that perhaps may be explained from the prevailing tendency of the period of exchanging the names of native divinities for Greek and Roman names. Besides these foreign elements, there are certain metaphysical and physical views incorporated in their creed which are distinctly traceable to Aristotle, and finally, the theurgico-Neoplatonic religious philosophy of heathenism, such as is found in Porphyry, Proclus, Iamblichus, and the rest. All these apparently incongruous elements, however, infused into it by the circumstances of the period, do not prevent Zabism from being in reality heathenism. Were further proof needed, we should find it in the words of a celebrated Zabian, Thabît ben Korra, quoted by Barhebræus, in the shape of a panegyric on the town of Harran and its heathenism, uttered, as Barhebræus says, in his "purblind obstinacy." After speaking of Christianity—not to its advantage—for some time, Thabît rejoices over the blessings that still belong to his native place, Harran, through its having kept itself utterly unsullied by that faith. "We," he continues (the Zabians or Harranians), "are the heirs and progenitors of heathenism, which has once been gloriously spread over this globe. Blessed is he who bears his burden for heathenism's sake with firm hopes. Who has civilized the world and built its cities, but the nobles and the kings of heathenism? Who has constructed the harbors and has made the rivers navigable? Who has taught the hidden science? To whom else has the deity revealed itself, given oracles, and told the things of the future, but to the most celebrated men among the heathen? . . . . Heathens have done all these things. They have brought to light the healing of souls; they have taught their salvation; they have also made manifest the art of healing the body; they have filled the world with institutions of government and with wisdom, which is the highest good. Without heathenism, the world would be empty and poverty-stricken, and swallowed up by great misery."

Without entering into a detailed account of the many sources whence our information is derived with regard to the creed itself, we shall briefly indicate that they are written in Arabic, in Hebrew, and in Greek. The former are the most copious; those in Hebrew are chiefly represented by Maimonides; and the Greek are ascribed to various pseudonymous writers, among whom figure Aristotle and Hermes Trismegistus. From their various, and, to a great extent, contradictory statements, we owe the following indications regarding the principal points of this creed: The Creator, it teaches, is in his essence, primitivity, originality, eternity, One; but in his many manifestations in bodily figures, manifold. He is chiefly personified by the seven leading planets, and by the good, knowing, excellent, earthly bodies. But his unity is not thereby disturbed. It is, the Zabians say, "as if the seven planets were his seven limbs, and as if our seven limbs

were his seven spheres, in which he manifests himself, so that he speaks with our tongue, sees with our eyes, hears with our ears, touches with our hands, comes and goes with our feet, and acts through our members." Nothing, we are told, is more foreign to Zabism than—what holds good of the creed of the Sabæans only—rude star-worship. Zabism according to the authority of Sharastani, expresses the idea that God is too great and too sublime to occupy himself directly with the affairs of this world; that he therefore has handed over the ruling of it to the gods, and that he himself only takes the most important things under his special care; that, further, man is too weak to address himself directly to the Highest, that he therefore is obliged to direct prayers and sacrifices to the intermediate deities to whom the rule of this world is intrusted. Thus the veneration shown to planets, and even the worshiping of idols, is nothing but a symbolical act, the consequence of that original idea. There are many gods and goddesses in Zabism of this intermediate stamp. It is not the planets themselves, but the spirits that direct and guide them and deliver them which are taken as deities of this kind—deities that stand to the spheres in the relation of soul to body. Apart from these, there are those gods who cause or represent every action in this world. Every universal natural deed or effect emanates from a universal deity, every partial one from a partial deity that presides over part of nature. Everything that appears in the air, which is formed near the sky or arises from the earth, always is the product of certain gods, that preside over these manifestations, in such a manner that the rain in general, as well as every special drop of it, has a presiding numen. These spirits also mold and shape everything bodily from one form into the other, and gradually bring all created things to the state of their highest possible perfection, and communicate their powers to all substances, beings, and things. By the movement and guidance of these spiritual beings, the different elements and natural compositions are influenced in such a way that the tenderest plant may pierce the hardest cliff. He who guides this world is called the first spirit. These gods know our most secret thoughts, and all our future is open to them. The female deities seem to have been conceived as the feeling or passive principle. These gods or intelligences emanate directly from God without his will, as rays do from the sun. They are, further, of abstract forms, free of all matter, and neither made of any substance nor material. They consist chiefly of a light in which there is no darkness, which the senses cannot conceive, by reason of its immense clearness, which the understanding cannot comprehend, by reason of its extreme delicacy, and which fancy and imagination cannot fathom. Their nature is free from all animal desires, and they themselves are created for love and harmony, and for friendship and unity. They are not subject to local or temporal changes, and they rule the heavenly bodies, without finding the motion of the most heavy too heavy, or that of the lightest too light. Their existence is full of the highest bliss, through their being near to the Most High, whom day and night they praise, without ever feeling fatigue or lassitude, to whom they are never disobedient, but whose will they always fulfill with supreme delight. They have a free choice, and always incline to the good. "These spiritual beings, our lords and gods, are our intermediators and advocates with the Lord of lords and God of gods." All substances and types of the bodily world emanate from the spiritual world, which is the one from which everything flows, and to which everything returns, and which is full of light, sublime and pure. These two worlds correspond to each other, and are to each other like light and shadow. The way to approach these gods, and, through them, the highest essence, is by purifying our souls from all passions, by keeping a strict guard over our words and deeds, by fasting, heartfelt prayer, invocations, sacrifices, fumigations, and incantations. By steadfastly persevering in these and similar acts of devotion, man may reach so high a step of perfection that he may communicate even directly with the Supreme Power. The planets, as the principal representative and intermediate gods, are to be carefully observed, especially as regards—1, the houses and stations of the planets; 2, their rising and setting; 3, their respective conjunctions and oppositions; 4, the knowledge of the special times and seasons, the hours and days of the ruling of special planets; 5, the division of the different figures, forms, climates, and countries, according to their dominant stars—the prevailing notion of the Zabians being, like that of the Chaldees and the sect of the so-called Mathematicians (according to Sextus Empiricus), as well as of the Neoplatonists in general, that everything below heaven was subject, in a manner, to the influence of stars, or the spirits that inhabit and rule them. Every substance and every action, every country and every hour, has its special planetary deity. It is therefore well to study carefully the special conjunctions and figures, as well as the special mixtures of incense, which might cause the individual numen to be propitious. Thus, e.g., according to the Zabian belief, the first hour of Saturday stands under Saturnus, and it is therefore right and advisable to select at that time such prayers, seals, amulets, dresses, and fumigations as might be supposed to be particularly pleasing to that planetary god.

In order to address themselves to *visible* mediators, some of the Zabians are supposed to have directed their devotions to the stars themselves. But they soon found how futile a worship it was that addressed itself to things that appeared and disappeared in turn. They therefore manufactured permanent representatives of them in the shape of idols—idols wrought in as complete accordance as possible with the theurgical rules derived from the nature of the deity to be represented. They were of gold, to represent the

sun; of silver, to indicate the moon. The very temples in which they were placed were of as many corners as were supposed to correspond to the form of certain stars.

We know but little with regard to the cosmogonical notions of the Zabians. Sharsstani, one of our principal authorities, only quotes "Agathodæmon" as his authority for their assuming five primeval principles, viz.: the creator, reason, the soul, space, the vacuum. Out of these, all things are composed. According to another source (Kathibi), however, the Zabians assumed two living and active principles—viz., God and the soul; further a passive one, matter; finally, two which are neither living nor passive—viz., time and space. Matter seems to have been held by them to be primeval and everlasting, and to it alone the existence of evil is attributable. God created the spheres only, and the heavenly bodies therein. It is these spheres (fathers) which carry the types or ideas to the elementary substances (mothers), and out of the combination, conjunction, and motion of these spheres and elements, the varying earthly things (children) are produced. Matter is, as we said, because of its defective nature, the source of evil, of ignorance, of folly; while the form is the source and fountain-head of the good, the right, the knowledge, and the understanding. Zabism further assumes a renewal of this world after each great "world-year,"—a space of 36,425 ordinary years. At the end of these periods, the plants, the animals, and the men that had existed within it, cease to propagate themselves, and a generation of each of them, different from all previous ones, springs into life. How far this theory is identical with the Babylonian, Egyptian, and Indian theories on the same subject, we cannot here investigate; suffice it to call attention to the striking likeness apparent in them all.

Man, the Zabians teach, is composed of contradictory elements, which make him the vacillating, struggling creature he is. Passions and desires rule him, and lower him to the level of brute creation, and he would utterly lose himself, were it not for such religious rites as purifications, sacrifices, and other means of grace, by which he may be enabled to approach the great gods once more, and to attempt to become like unto them. There are different kinds of souls; or rather man's soul partakes partly of the nature of the animal soul and partly of that of the angelic soul. The soul never dies, and punishments and rewards will affect only it, but not everlastingly. But rewards and punishments will not be wrought in any other future world, but in this, only at different epochs of existence. Thus, all our present joys are rewards for good deeds done by us in former epochs; and the sorrows and griefs we endure, spring in the same manner from evil actions we committed at former stages. As to the nature of the general (world-) soul itself, they say that it is primitive, for if it were not so, it would be material, as every newly created being partakes of the material nature. Yet a material soul would be an impossibility. "The soul, which is thus an immaterial thing," says Kathibi, "and exists from eternity, is the involuntary reason of the first types, as God is the first cause of the intelligences. The soul once beheld matter, and loved it. Glowing with the desire of assuming a bodily shape, it would not again separate itself from that matter of which means the world was created. Since that time, the soul forgot itself, its everlasting existence, its original abode, and knew nothing more of what it had known before. But God, who turns all things to the best, united it to matter, which it loved, and out of this union the heavens, the elements, and other composite things arose. In order that the soul might not wholly perish within matter, he endowed it with intelligence, whereby it conceived its high origin, the spiritual world, and itself. It further conceived through it that it was but a stranger in this world, that it was subject to many sufferings in it, and that even the joys of this world are but the sources of new sufferings. As soon as the soul had perceived all this, it began to yearn again for its spiritual home, as a man who is away from his birthplace pines for his homestead. It then also learned that, in order to return to its primitive state, it had to free itself from the fetters of sensuous desires, and from all materialistic tendencies. Free from them all, it would regain its heavenly sphere again, and enjoy the bliss of the spiritual world."

From all this, it will be seen, as we stated at the outset—that the Zabians, about whom so much has been theorized and fabled, were simply heathens who had to a certain extent adopted and modified Neoplatonic ideas, such as floated in the mental atmosphere of the early Christian centuries. It would be needless to enter into a discussion about the semi-fabulous personages to whom they ascribe the foundation of their creed, such as Agathodæmon, Arani, Hermes, and the rest; or some of those mentioned by other writers, such as Zerdusht, Nawassib, Orpheus, and the rest.

The life of this sect was but short. After having first been on terms of great friendship with the ruling powers of Mohammedanism as well as with Christians and Jews, and having filled many of the highest and most responsible posts at the courts of the caliphs, they were by degrees made the butt of fanaticism and rapacity. Mulcted, persecuted, banished at different periods, they disappear from history since the middle of the 11th century. Some obscure remnants of them seem to have survived in remote corners of Mesopotamia, but they, too, no longer adhere to the original creed, but are mixed up with the Mendaïtes, mentioned above, and the Shemsijeh, or sun-worshipers. Thus obscurely ended a sect which, for 200 years, had produced a host of men pre-eminent in every branch of learning and literature, in philosophy, astronomy, history, natural history, poetry, medicine, and the rest. Many of these men, whose name and fame reached Europe, were confounded with their Mohammedan contemporaries,

chiefly because they lived in Bagdad, at that time the center of learning, the seat of the caliphs and the high dignitaries of state. The Mohammedans, however, had so high an appreciation of Zabian learning, that it became proverbial among them, and they could explain it only by tracing it to a supernatural source, notably to Hermes (Trismegistus), the father of the Zâbî, mentioned above.

We have in our sketch mainly followed Chwolson, who, aided by profound learning and acumen, has been the first to clear up the nature of Zabism, this terrible stumbling-block of many generations of investigators.—For detailed information on it and all the many other points connected with it, we must refer our readers to the large work in which he has embodied the results of his investigations: *Die Ssabier und der Ssabismus* (2 vols. St. Petersburg, 1856). See also NEOPLATONISTS, GNOSTICS.

ZACATE'CAS, a state of Mexico, bounded on the n. by Coahuila, on the e. by San Luis Potosi and Aguas Calientes, on the s. by Jalisco, and on the w. by Jalisco and Durango; 24,757 sq. m.; pop. '95, 570,814. The surface, which is intersected by a ridge of the Sierra Madre, is mountainous or hilly, with scanty supply of water. The soil in the valleys is fertile, and the climate warm, except in the higher regions. Copper, lead, quicksilver, and silver are found, the last in great abundance. Capital, Zacatecas.

ZACATE'CAS, capital of the Mexican state of that name, is situated in the windings of a deep valley or ravine, between high hills, about 439 m. by rail n.w. of Mexico. It is built over a vein of silver, which has been deeply explored. The streets are narrow and crooked, but it has a fine appearance from a distance, owing to the size and massiveness of its churches and the elegance of some of its residences. There are also a college, a cathedral, a gun-powder mill, and a mint. Pop. '95, 40,026.

ZACHARIAS, a Roman pontiff, successor of Gregory III. in 741, who is noticeable as one of the series of Greek prelates by whom the destinies of Rome and Italy were much influenced in the 7th and 8th centuries. The name of Zacharias, moreover, deserves honorable mention in connection with a work of benevolence and charity, which the Roman church afterward consecrated by intrusting it to a special religious order—viz., the redemption of captives from the pagan masters by whom they had been held in slavery. During the troubles arising out of the Lombard invasion, Zacharias, by his interposition in more than one instance in favor of the city of Rome with the Lombard kings, contributed to that prestige of the Roman see which eventually led to its obtaining the leadership of Italy, and in the end the temporal sovereignty of Rome and the adjoining territory. Zacharias died at Rome on Mar. 14, 752.

ZADONSK, a t. of Russia, in the government of Voronej, 50 m. n. of the town of that name, and about 230 m. s. of Moscow, on the left bank of the river Don. Pop. '80, 9,100. The trade of the town is not extensive, owing to the close neighborhood of the commercial towns Eletz and Voronej. The manufactures are insignificant. Zadonsk possesses a renowned cloister.

ZAFARAN'-BO'LI, a t. of Asia Minor, in Anatolia, about 190 m. e.n.e. of Scutari, at the junction of two small affluents of the Chati-su. It has four handsome mosques, a church, large baths and khans, and extensive suburbs. It has a considerable trade in saffron (whence its name), which is cultivated extensively in the surrounding country. Pop. supposed to be about 15,000.

ZAFFRE, crude oxide of cobalt, made by roasting cobalt ore and reducing it to powder, with the addition of about three parts of the finest white sand used by glass-makers. It is extensively prepared in Saxony, and is often imported into Britain. When fused into a glass, it is intensely blue, and is much used by enamelers and porcelain manufacturers as a blue color.

ZAGAZIG, a t. of Egypt; pop. '82, 19,845. It is 75 m. n.w. of Suez, on the canal leading to the isthmus from the Nile. Zagazig is the center of a great cotton trade, and is near the ruins of Bubastis.

ZAHN, JOHANN KARL WILHELM, 1800-71; b. Germany; educated at Cassel. He studied architecture and painting, lived for many years in Italy, and became professor at the Berlin academy of fine arts in 1829. His principal work is his *Die Schönsten Ornamente und Merkwürdigsten Gemälde aus Pompeji, Herculaneum und Stabiä* (1828-30).

ZÄH'RINGEN, a small village near Freiburg, in Baden, in the Breisgau, formerly a province of Austria, but annexed to Baden in 1805. It is historically noteworthy for the ruined castle from which the dukes of Zähringen took their name, the ancestors of the reigning house of Baden (q.v.). The Hapsburgs (q.v.) are traced to the same stock. Guntram or Gunthrun the rich, count of Breisgau—son of the famous Erchanger, who raised himself to the dignity of duke of Swabia and was beheaded for treason in 917—is assumed as the founder of the house of Zähringen. The Zährings claim to be descended from his eldest son, Gebhard; the Hapsburgs from the younger, Langelin. After the death of duke Berthold I., 1077, the house was divided into two lines—the ducal or Zähring line, which became extinct in the male line in 1218, with Berthold V., the founder of Bern; and the markgraf or Baden line, from which the present house of

Baden is descended. The ducal Zähringe exercised a beneficent sway over a great part of Switzerland.

ZAIRE. See CONGO.

ZAKRZEW'SKA, MARIE ELIZABETH, b. Berlin, 1829; studied medicine, in which she became proficient. Leaving Germany on account of the prejudice against female physicians, she came to New York in 1853. Having taken a medical degree at Cleveland college, Ohio, she returned to New York, where, in association with the Blackwell sisters, she founded the New York infirmary, of which she was resident physician for two years, when she settled in Boston, where she established the New England hospital for women and children, 1863.

ZALA, a co. in s.w. Hungary, adjoining Croatia and Styria; 1974 sq. m.; pop. '90, 406,699. The surface is uneven and heavily wooded. Wine, honey, and agricultural staples are the chief productions. Capital, Zala-Egerszeg.

ZALEU'CUS, the celebrated lawgiver of the Epizephyrian Locrians in Southern Italy. Of his history nothing reliable is found, the ordinary account making him a slave-shepherd, who by his extraordinary abilities having obtained his freedom, became chief magistrate. Diodorus represents him to be of good family. It is said that the people applied to the oracle of Delhi for a remedy for prevailing disorders, and were commanded to make laws for themselves. These Zaleucus gave them, which he professed to receive from Minerva. They were given 660 B.C., 40 years before those of Draco, and were the first written laws possessed by the Greeks. His laws, though severe, were for a long time greatly celebrated, and so averse were the people to a change that if any one proposed a new law he was compelled to appear in public with a rope around his neck, and if his proposition was rejected he was immediately strangled. Adultery was punished with the loss of both eyes.

ZA'MA, a city and fortress in Numidia, about 85 m. s.w. of Carthage, near which Hannibal was defeated by the younger Scipio, 202 B.C. The flower of Hannibal's forces consisted of a small veteran army, that had shared his fortunes for many years; most of the rest were of inferior quality, of many races, variously organized, and of suspicious fidelity. But his greatest deficiency was in cavalry, an arm with which he had repeatedly decided the victory in former battles. In Scipio's army, on the other hand, Numidians, under Masinissa, were present in overwhelming numbers. The onset of Hannibal's elephants, of which he had 80, was defeated and made worse than useless by the wise precautions of Scipio; the cavalry on his flanks were scattered by the furious charge of Masinissa and Lælius; his front line of mercenaries beaten back by the more numerous and better-disciplined Romans. His veteran infantry, hemmed in on all sides, fought with the courage of despair, and were cut to pieces. Hannibal having done everything, both before and during the battle, which could secure the victory, escaped with a few horsemen. Of the Carthaginians, 20,000 were left dead on the field, and an equal number taken prisoners. Of the victors, 2,000 fell in the action.

ZAMACOIS, EDUARDO, 1842–71; b. Bilbao, Spain; studied art at the Madrid academy, at Rome and Florence, and in Paris as a pupil of Meissonier. He became a *genre* painter of the first rank. Among his most popular pictures are, "Cervantes as a Recruit," "The Hunchback," "Bull Fighters Riding into the Arena," and "The King's Favorite."

ZAMBE'SI RIVER AND REGION. The extensive region in s.e. Africa, known to mediæval geographers under the general name of the empire of Monomotapa, is shown on old maps as drained by a river called Zambese, or Zambere, on the banks of which appear large towns, of which the mythical "Vigita Magna" was supposed to be the most famous. The course of the stream, which is the modern Zambesi, is, however, pretty correctly delineated, and even a small lake is shown in connection with it, not far from the real position of lake N'gami, whose existence we only became aware of a few years ago, and which we now know may be considered one of the most southern collections of inland waters which communicate with the Zambesi river and the more eastern lakes. The Nyassa or Maravi, as well as the more northern lakes, Victoria N'yanza and Tanganyika (the latter in connection with the Nile basin), are also given with such a degree of accuracy that it plainly shows, that in compiling these early maps, the distinctive features of the region must have been well known—principally, it is supposed, from Arab sources, various settlements of that people inhabiting the e. and s.e. coast of Africa from the Red sea to Sofala.

Although the lower region of the Zambesi, for a distance of at least 300 m. from its mouth, has been in possession nominally of the Portuguese since the beginning of the 16th c., forming the captaincies of Riosdi Senna, Tete, and Quilimane, yet it is only within the last few years, through the indefatigable exertions of Dr. Livingstone (1851–56, and 1858–64), Mr. Oswell, Dr. Kirk, Mr. T. Baines, Mr. James Chapman, Charles Andersson, Maj. Pinto, and other explorers, that we have got anything like an accurate or scientific idea of this vast region, which extends from 8° to 21° of s. lat., and from 14° to 37° of e. long.; and the total length of what may be considered the main stream (called Leambye in its upper course), from its mouth to the point shown on Dr. Living-

stone's map, where the Leeba river, which proceeds from lake Dilolo—on the summit of the water-shed which divides the rivers running n.w. into the Atlantic from those running s.e. into the Indian ocean—joins it, cannot be less than 1200 miles.

The river-basin of the Zambesi is coterminous, on the n., with a large area of the Congo river system, and the great lakes that drain into it; on the s. and w. an obscurely marked water-shed, crossing the Kalihari desert, separates it from the Orange river basin and the rivers that run through Ovampo land into the Atlantic; while on the s.e., a well-defined mountain-range divides the rivers flowing into the Zambesi from those which form the Limpopo river, running into the Indian ocean.

The name of Zambesi is preserved from the mouth of the river, or rather a short distance above it, to the junction of the main stream with the Chobe, in lat. 17° 31′ s., long. 25° 13′ east. Thence to its junction with the Leeba (Liba), coming from lake Dilolo, the Zambesi is called Leeambye (Liambai); and at the junction (lat. 14° 10′ s., long. 23° 35′ e.) it turns suddenly to the n.e. Part of the basin of the upper Zambesi was explored by maj. Serpa Pinto in 1878–79. Crossing from the w. several of the head-waters of the Cubango (Andersson's Okavango), formerly thought to connect with the Zambesi, Pinto found that the source of the Cuando (Kwando—Livingstone's Chobe), the chief tributary of the Zambesi, is about lat. 13° s. and long. 19° east. He passed several of its upper branches, and descended to the Leeambye by another tributary called Nhengo. The Cuando is a fine large stream, draining a large area of fertile country, and receiving several navigable affluents. Lake Dilolo, from which the Leeba flows, seems to have an outlet both to the n. and to the south. The northern outlet probably runs into one of the tributaries of the Congo.

In the region where the Leeba joins the Leambye the main stream is often as wide as the Thames at London bridge, and perhaps as deep. From the confluence to the Victoria falls there are many long tracts over which vessels as large as the Thames steamers could freely ply. But there are serious obstacles in the way of anything like navigation for hundreds of miles at a stretch—as seems now to be possible on the Congo (Livingstone) above the Yellala falls. Large areas in this region are liable to be flooded, and to stand under water for considerable periods at a time.

This part of central s. Africa may be considered as an extensive plateau or tableland, from 3,000 to 4,000 ft. above the sea-level, with an outer fringe or border of basaltic rocks, cutting through which the Zambesi river forms one of the most striking scenes in the physical geography of the universe—namely, the Victoria falls of Livingstone, or Mosiotunya, or "Smoke sounds there," of the natives. Here, a few m. to the e. of where the Chobe joins the Zambesi, the latter—a stream of 1000 yards in width—plunges down into a chasm more than 100 ft. deep, forming an immense crack in the basaltic rock at right angles to its course, and is carried along in a narrow channel some 30 m. in the same direction. Within a distance of 220 m. above the falls the river has 72 cataracts and rapids.

The Cubango (the Okavango of Andersson), draining a large district of the Benguela highlands, was supposed to run into the Zambesi; but according to Pinto it passes through lake N'gami, and emerging as the Botletle, ends in the Makarikari, an enormous basin into which many rivers run and are evaporated. In its lower course the Zambesi varies in width from 500 yards to 2 m. and more, in the rainy seasons. From the Portuguese town of Tete downward it is navigable, although with difficulty in the dry season; and it passes through one or two narrow rocky gorges in the Lupata mountains, which form ugly rapids, except when the river is in full flood. About 80 m. from the mouth it receives from the n. the waters of the Shiré, which runs out of lake Nyassa, the Maravi of old geographers, an extensive sheet of water above 300 m. long, and 50 m. across at its widest part, extending between lat. 11° and 14° 30′ s., and it enters the low country about 50 m. from the ocean, where it divides into many branches, forming a large delta, of a very unhealthy character. The most northern stream is called the Kwaka, or Kilimane, or Quilimane river; and the most southern and deepest channel, the Luabo. At the Kilimane, or Quilimane, about 18 m. from the sea, is the residence of the Portuguese governor of the region; but there are various other entrances used by slavers and contrabandists, which are not very accurately laid down in our charts; and it is both difficult and dangerous to enter the river without a competent pilot.

The Victoria falls are estimated to be 2,500 ft. above the sea-level. Tete is considered to be 400 ft.; and the rapids of lake Nyassa, where the Shiré issues from it, are 1552 ft. above the same; while lake Shirwa, a smaller lake, s.e. of Nyassa, is 2,000 feet.

The natives inhabiting the coast region drained by the Zambesi must be considered of the pure negro type; while the Makololo, who were found in the central and upper country, belonged to the Betjuana family. According to Maj. Pinto this tribe has now ceased to have a separate existence. In the reign of the third king of a dynasty of conquerors, the Luinas, the former masters of the country, again came into possession, and early in 1878 the remaining Makololos were put to death. On the upper Zambesi, between the Cuando and Cubango, Maj. Pinto discovered the Mucassequares, a tribe of Ethiopian origin, of a yellowish-white color. The Zulu tribe of Amatabele, under Mosilakatze, who inhabit the high region dividing the Limpopo from the Zambesi basin, have overrun and conquered nearly all the tribes s. of them. The slave-trade is actively carried on in the countries nominally claimed by the Portuguese; unsuccessful attempts

were made a few years ago to plant an episcopate and civilize the natives, through the influence of missionaries.

All the usual tropical productions are found, but, owing to the disturbed state of the native tribes, are but little cultivated. The animal kingdom is very similar to that of the adjacent regions of s. Africa; and an immense quantity of ivory is exported both from the w. and e. coasts. The prevalence of the tsetse (q.v.) makes traveling difficult in the interior. Extensive coal-fields exist, and gold is found in the neighborhood of Tete and Senna.—See the *Travels* of Livingstone; T. Baines's *Explorations;* Andersson's *Okavango; To the Victoria Falls of the Zambesi*, by Ed. Mohr (London, 1876); *Proceedings of the Geographical Society* (1879); and Pinto's *How I Crossed Africa* (1881).

ZA'MIA, a genus of plants or the natural order *cycadaceæ*, of which the species are found in the tropical parts of the world. They have a tree-like stem, with a single terminal bud and pinnate leaves. The wood consists of concentric circles, with very loose cellular zones between them. The male and female flowers are on separate plants, in tessellated catkins, the scales of which differ in form in the male and female plants. The central part of the stem contains much starch, especially in old plants, and a kind of sago or arrowroot is made from some of them. The central part of the stem of the bread-tree (*Z. cycadis*) of s. Africa, which is about 6 or 7 ft. high, with a scaly stem, is much used as an article of food by the Kaffirs and Hottentots, who prepare it by wrapping it in a skin well rubbed with grease, burying it in the ground until it undergoes putrefaction, bruising it between two stones, making it into cakes, and baking it in wood-ashes. There are numerous fossil species of zamia. Closely allied to it is the fossil genus *zamites.*

ZAMIO'STROBUS, the generic name given to several cones from the secondary and tertiary strata, because they were supposed to be the fruits of fossil zamias. But Mr. Carruthers has shown (*Journal of Botany*, Jan., 1867) that they belong to true coniferæ. He has, however, in the same paper, described six species of fruits belonging to zamia-like cycads, to which he has given the generic title of *cycadeostrobus.* They are all from the secondary rocks. No cycadean remains whatever have yet been found in newer deposits.

ZA'MITES, the generic name under which are included numerous forms of zamia-like leaves which occur in secondary strata. No certain traces of the trunks have yet been found associated with them, and only one species (*Z. gigas*) is accompanied with fruit, and this is so anomalous that it casts considerable doubt on the determination of the affinities of the foliage.

ZAMOJ'SKI, Andrzej, Count, 1716–92; b. Zamosc, Poland; served for a time in the Saxon army, and reached the rank of maj.general. He was one of the first nobles to emancipate his serfs. He was grand-chancellor to Stanislas Augustus, and, in 1776, drew up a code of laws. This was adopted in 1791, before which time dislike to its liberal measures for securing emancipation of the serfs had prevented its adoption.

ZAMOJ'SKI, Andrzej, 1800–74; b. Poland; the grandson of Gen. Andrzej Zamojski; educated at Geneva and Edinburgh. In 1823 he entered the Polish civil service, and in 1831 was minister of the interior to the revolutionary government. After the failure of the patriotic movement Zamojski remained on his estates, freed his serfs, carried on an agricultural paper, started a private bank, introduced steam-navigation on the Vistula, and was at the head of a great agricultural association regarded with disfavor by the government. In 1862 he was banished, and the rest of his life was spent in Paris.

ZAMOJ'SKI, Jan, 1541–1605; b. Poland; educated at Strasburg and Padua. Henry of Anjou, on his accession to the Polish throne in 1572, made him grand-chamberlain. When Henry gave up the throne, Maximilian II. of Austria was chosen king by a party of the nobility. Another party, whose leader was Zamojski, succeeded in making Stephen Báthori of Transylvania, king, who appointed Zamojski grand-chancellor. He was commander-in-chief during the war with Russia, 1580–82, and secured favorable terms of peace. His influence with Báthori, whose niece he had married, made him unpopular, and he took but little part in public affairs. On the death of Báthori he procured the election of Sigismund III., though he himself might have been king. The latter part of his life was spent in fighting the Turks, Tartars, Swedes, and other nations. He was a munificent patron of literature.

ZAMORA, an interior state of western Venezuela; area, 25,212 sq. m.; pop. '91, 246,676. The famous Barinas tobacco is grown in the mountain region, and cattle raising is carried on in the plains. Capital, Guanore.

ZAMORA, a province in n.w. Spain, once part of the kingdom of Leon, bordering on Portugal, and on the provinces of Salamanca, Leon, Valladolid, and Orense; 4135 sq. m.; pop. '87, 270,072. The surface is level and fertile; grain, fruit, and wine are the chief products. Antimony and lead containing some silver are found. Capital, Zamora.

ZAMO'RA, a very ancient t. of Spain, capital of the province of that name, is situated 40 m. n. of Salamanca, and 182 n. w. of Madrid, on the right bank of the Douro, which is here crossed by a fine bridge. It is the see of a bishop suffragan of Santiago. Zamora

was of great importance in the Moorish times, and is said to have been inclosed by seven lines of walls, with a moat between each. It is entered by seven gates, is surrounded by a wall, has a massive square tower with Norman arches, and many interesting remains of mediæval architecture. *La Magdalena*, a church of the Templars, but afterward belonging to the order of St. John of Jerusalem, is a simple solid edifice of the 12th c., slightly modernized. There are a number of other churches, besides a theological school, barracks, a prison, a normal and other schools, a library, museum, etc. It has manufactures of serges, linens, leather, hats, liqueurs, brandy, and a considerable trade in wine and grain. Sir J. Moore urged the Junta of Salamanca to repair the defences of Zamora, and receive there his stores; but his retreat had commenced before they had done deliberating. The French afterward got possession of it, and later sacked and plundered it, since which time it has never recovered these visitations. Pop. '87, 15,292.

ZA'MOSC, one of the most strongly fortified towns of Russian Poland, in the government of Lublin, 50 m. s.e. of Lublin, and 154 s.e. of Warsaw, surrounded by water and a marsh. All the houses are built in the Italian style with arcades. There is a large and beautiful castle opposite the former university, town-hall, and arsenal, churches, monasteries, theater, etc. There are beer and porter breweries. Pop. about 9200.

ZAMOUSE, *Bos brachyceros*, a species of ox or buffalo, found in the tropical parts of western Africa. It is the *bush cow* of Sierra Leone. It differs from the buffalo and all other *bovidæ* in several important particulars, especially in the very large size and peculiar fringing of the ears, and in the total want of dewlap. The forehead also is flatter than that of the buffalo. The color is nearly uniform—a pale chestnut. The hair is thin and nearly erect. The ears have three rows of long hairs springing from the inside, and a tuft of long hairs at the tip. There is a considerable space on the forehead between the horns,—which are not long, extend outward and upward, are suddenly incurved, and very sharp.

ZANE, EBENEZER, 1747–1811; b. Va.; built about 1770, at what is now Wheeling, a block-house, which was several times unsuccessfully assaulted by the Indians during the revolution. He held a number of civil and military offices. His settlement was the earliest permanent one on the Ohio. The land on the Muskingum river, where Zanesville now stands, belonged to him.

ZANESVILLE, city and co. seat of Muskingum co., O.; on the Muskingum river, and the Baltimore and Ohio, the Cincinnati and Muskingum Valley, the Cleveland, Akron, and Columbus, the Bellaire, Zanesville, and Cincinnati, the Cleveland, Canton, and Southern, the Columbus, Sandusky, and Hocking, and the Zanesville and Ohio River railroads; 57 m. e. of Columbus. It has two hospitals, public library, female seminary, high school, memorial hall, several bridges, public parks, electric lights, electric street railroads, several national and private banks, over 20 churches, and daily, weekly, and monthly periodicals. The U. S. census of 1880 reported for Zanesville, 301 manufacturing establishments, employing $4,200,409 capital and 3687 persons, paying $1,560,933 wages and $3,331,626 for materials, and having a combined output valued at $6,053,484. The principal manufactures are encaustic tile, agricultural implements, glass, bent wood, stoves, soap, clay, and pottery products, flour and barley mills, etc. Pop. '90, 21,009.

ZANGUEBAR'. See ZANZIBAR.

ZANTÉ (ancient *Zacynthus*), one of the principal Ionian islands, about 9 m. from the w. coast of the Morea, and 8 s. of Cephalonia, is about 24 m. long, 12 broad, and has an area of 168 sq. miles. The greater part of the island consists of a plain, stretching from n. to s., with a breadth of from 6 to 8 m., bounded on the w. by a line of hills. The vine is extensively cultivated on the plain, and the wine produced is considered to be of a superior quality. Currants produced from a dwarf species of vine, originally brought from Corinth, are the staple product. Pomegranates, olives, melons, peaches, and citrons also are grown. Zante is said to have been colonized by Achæans from the Peloponnesus: and it is mentioned in Homer with the epithet "woody," which, however, is not apt at the present day, although it is justly called, in an Italian proverb, "the flower of the Levant." It is subject to frequent earthquakes, which, it would seem, are likely to recur about once in 20 years. The most notable mineral feature of Zante is its pitch-wells, described by Herodotus, which are situated about 12 m. s. of the town of Zante, in a marshy district. Pop. '89, 44,070.—ZANTÉ, the capital, is the largest town in the Ionian islands, and is situated at the head of a small bay or harbor on the e. coast, on the site of the ancient town, of which the only remains are a few columns and inscriptions. The houses stretch along the semicircular outline of the bay to the distance of a mile and a half, and extend up the slope of the castle hill. Most of the streets are narrow, but clean, and the older houses built in the picturesque Venetian style; the huge lattices of wooden frame-work, resembling those employed in eastern harems, with which the windows used to be fitted, are being rapidly abolished. The principal street is broad

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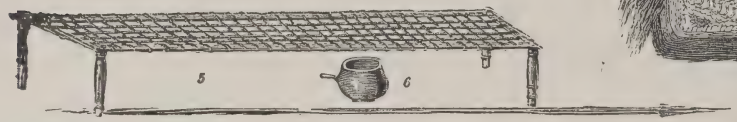

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ZANZIBAR AND SOM LI.—1. Suaheli of Zanzibar. 2. Profile of Suaheli woman. 3. Tshaga (o
and table. 6. Chaga wooden pot. 7. Weapon. 8. Chaga wooden bowl. 9. Wooden foo
of Zanzibar. 14. Arabian soldier in the service of the Sultan of Zanzibar. 15. I
18. Mukomanga and Mnyassa youths. 19. Giraffe's tail used as ornament. 20. Zai
Mogedshoo, Somali. Somali implements and weapons: 24. Quiver. 25. Saddle. 26. P

haga) girl. 4. Zanzibar Arabian. 5. Kibani (settee) used on the entire coast as bed
press. 10. Chair used on the coast. 11. Suaheli family. 12, 13. Ships of the vicinity
uba women. 16. Makuavi woman and child. 17. Wibongou woman and child.
bar hoe. 21. Midgerthanian woman, Somali. 22. Armed Somali. 23. View of
ed bag or pot. 27. Hatchet. 28. Wooden pot. 29. Lance.

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and handsome; the churches are numerous, and the market-place spacious. The harbor of Zanté has been greatly improved of late years; it is now protected by a long mole, and has a light-house, but is still somewhat exposed and insecure. A magnificent and extensive view is obtained from the citadel in the highest part of the town. Zanté is the see of a Greek protopapas, and of a Roman Catholic bishop. Pop. '89, 16,603.

ZANZIBAR', or ZANGUEBAR, a sultanate of East Africa under British protection. It is bounded on the n. by the independent tribes of Somal and Gallas, and on the s. by the Portuguese province of Mozambique. The extent of the coast is about 1100 m. and parallel to it are numerous islands, the most important of which are Zanzibar, containing the capital of the same name, Pemba, and Máfia (Monfia on the charts). The territories on the mainland have no defined limit toward the interior, being occupied by heathen tribes, over whom the sultan's authority is hardly even nominal beyond the sea-board. The soil along the coast is fertile in rice, millet, peas, beans, melons, pumpkins, the sugar-cane, cocoa-nut, banana, plantain, etc., and the forests supply the caoutchouc tree and many valuable species of timber. Cattle, sheep, and fowls are plentiful, and tropical wild animals abound. Rice, sugar, molasses, ivory, gums, gold, and cowries are exported. The heat on the coast is excessive, and the climate very unfavorable to Europeans. The name Zanzibar is applied to the coast from 3° n. to 10° 42′ south.

The island of Zanzibar, by far the richest and most important part of the sultan's dominions, is distant from 20 to 30 m. from the African coast; it is about 38 m. in length and from 15 to 30 in breadth. It contains an area of about 625 sq. m., and the soil is in most parts of exceeding fertility; being covered with woods and plantations, and, the frequent rains causing perpetual verdure, it everywhere presents a delightful appearance. It is very flat, the highest point being not more than 300 ft., composed entirely of coral, and abundantly watered by rivulets, which flow at all seasons of the year. The principal products are cocoa-nuts, cloves, rice, sugar-cane, manioc, millet, and fruits in the utmost abundance, especially oranges of the finest quality, which can be purchased at the rate of 1000 for four shillings. The island is intersected by paths and green lanes in every direction, affording a never-ending variety of pleasant walks and rides. The country-houses of the Arab proprietors and the huts of their slaves are thickly dotted over the surface, surrounded with gardens and fields. The hedgerows are covered with flowering creepers, and pine-apples grow among them in wild profusion. In many parts are glades of undulating grass-land, of park-like appearance, dotted with gigantic mango-trees; the ponds are covered with rushes and water-lilies; and the air is perfumed with the blossoms of the orange and clove. The pop. of the island is estimated at about 150,000. The town contains about 80,000 permanent inhabitants, while a large number of strangers come from Arabia, India, and the northern parts of Africa during the season of the n.e. monsoon. The chief people are the Arab landed proprietors, who form a sort of aristocracy, possessing large plantations and numerous slaves; besides these, there are slaves, free blacks, natives of the Comoro islands and Madagascar, and from 5000 to 6000 natives of India, who keep nearly all the shops in the town, and through whose hands nearly all the foreign trade of the place passes. The language of the court and of the Arab population is Arabic, while the slaves and the free black population speak a dialect called *Kisawahéli*, one of the great family of South African languages.

The climate of Zanzibar is extremely equable and salubrious, the thermometer having probably never risen as high as 90°, nor fallen lower than 70°. The mean annual rainfall is 56.2 in.

The capital is extensive, but, like most oriental towns, it is narrow, irregular, and ill built; the houses of the principal inhabitants and of the European residents are large flat-roofed buildings, generally with an interior court-yard, and some of them, and especially the palace of the sultan, may almost claim to be magnificent. This town used to be one of the greatest slave markets in the world. Other important coast towns are Mombasa, Kilwa, Bagamoyo (all more than 10,000), etc.

The trade of the sultanate is very considerable. In 1892 Zanzibar the town was declared a free port. In 1895 the trade of the sultanate was as follows: Imports, £1,293,646; exports, £1,199,841. The imports consist of cotton goods, brass wire, beads, arms, etc.; and the exports, of gum-copal, cloves, ivory, cocoa-nut oil, sesame, dye-stuffs, and a great variety of other articles.

By the Anglo-German agreement of July, 1895, the protectorate of Zanzibar was conferred on England, while Germany acquired all the rights of the sultan over the mainland on payment of a sum of 4,000,000 marks. The earliest settlement of Arabs on the e. coast of Africa occurred about 924 A.D.; and for several centuries flourishing republics, governed by elders, elected by the citizens, existed along the coast. Vasco da Gama visited Zanzibar in 1499, and in 1503 the dominion of Portugal was recognized by the inhabitants, who agreed to pay an annual tribute; but the Portuguese never held it for very long periods. About 1735 A.D. they were finally expelled, and in 1784 the island was taken by the imaum of Muscat, in whose family the government remained until the death of Seyed Saeed bin Sultan, in 1854, when the Arabian possessions fell to his son Seyed Thoweni, and Zanzibar and its dependencies to Seyed Majid (died, 1870), elder brother of the present ruler, Seyed Allin bin Said, who has entered into treaties with Great Britain for the suppression of the slave-trade, and yielded the protectorate to England. In addition to adjoining illus., see illus., AFRICA, Vol. I.

ZA'RA (ancient *Jadera*), the capital of Dalmatia, Austria, on the coast of the Adriatic, 73 m. n.w. of Spalatro, and about 130 s.e. of Trieste. Till 1873 Zara was strongly fortified. It is built in the form of an oval, on a narrow promontory, separated from the mainland by a moat, across which is a draw-bridge. The town is entered by two gates, one from the sea, called Porta-Marina, supposed to be partly of Roman construction; and one from the landward side, called Porta-di-Terra-Firma. The ramparts, of Venetian construction, and partly planted, afford a fine promenade to the inhabitants. There is a spacious and well-protected harbor, which, however, is somewhat shallow. The streets generally are narrow and ill paved, and the drainage defective; the town is not well supplied with water. Of its churches, the most noteworthy are its cathedral, founded by Henry Dandolo, doge of Venice, and the church of the patron saint, St. Simeon. There are many convents and monasteries; a lyceum, gymnasium, and other schools; a barrack and a naval and military arsenal; hospitals, a theater, museum, and other public buildings. There is a lofty marble column, which is all that is left standing of an ancient Roman temple; there are also the remains of a Roman aqueduct. Zara is the seat of the government of Dalmatia and the see of a Roman Catholic archbishop. The commerce is unimportant. Many of the inhabitants are engaged in fishing and in the coasting-trade. The chief manufactures are rosoglio, maraschino, leather, silk, and linen fabrics. Pop. '90, 11,496, Italians by descent, and speaking the Italian language. Anciently, Zara was the capital of Liburnia, in Illyricum; and under Augustus it was made a Roman colony. See illus., ITALIAN ARCHITECTURE, vol. VIII.

ZAPA'TA, a co. in s. w. Texas, separated from Mexico by the Rio Grande; 1370 sq.m.; pop. '90, 3562, chiefly of American birth. Stock-raising is the principal occupation. Co. seat, Carrizo.

ZARAGO'ZA. See SARAGOSSA.

ZARAISK, a Russian t. in the government of Riazan, 40 m. n.w. of the town of Riazan, and 80 s.e. of Moscow, a few miles from the right bank of the Oka, a tributary of the Volga. The town was founded in the 13th c.; and in 1531, Ivan the Terrible erected on the site of the old fortifications a strong fortress, which thrice resisted the assaults of the Tartars, and which still exists. Another noteworthy object is the cathedral of St. Nicolas, which dates from 1631. There are manufactures of soap and candles, as also several tanneries and breweries; these, however, produce only sufficient to meet the wants of the inhabitants. The commerce of the town has greatly declined since 1847, when the new road of Riazan was opened, leaving Zaraisk out of the way. Pop. '93, 6885.

ZARAND, a former co. in s.e. Hungary, bounded n.e. and s. by Transylvania. The surface is mountainous, and is drained by the White Körös, a branch of the Theiss. Mines of iron, lead, and silver are worked. Its capital was Körös-Bánya, which is now the capital of the county of Hunyad.

ZARATHUSTRA. See ZOROASTER.

ZARS'KOESELO. See TSARKOESELO.

ZARITZIN, or TSARITSINE, a town of s.e. Russia, in the government of Saratov, and 224 m. s.s.w. of Saratov, on the right bank of the Volga, where the course changes from s.w. to s.e. It is an important railway center, as well as the center of trade for all points of the Volga. Naphtha, salt, and mustard, are the chief articles of trade. There are churches, a theater, public library, and gymnasia. Pop. '97, 55,914.

ZAUSCHNERIA, a flowering plant brought from California more than 30 years ago, and named after M. Zauschner, a Bohemian botanist. There is only one species known, and it has not been called by a common name. It is a perennial, belonging to the evening primrose family (see ŒNOTHERA). It has numerous stems from 1 to 2 ft. high, with ovate and ovate-lanceolate leaves, which, like the other parts of the plant, are soft and downy; flowers sessile in the axils of the upper leaves in the form of a raceme. They are about 2 in. in length, and resemble those of the fuchsia, belonging to the same family; long calyx four-lobed, corolla four-petaled, both of brilliant scarlet. The eight stamens and the long style project beyond the corolla. The seeds, which may generally be found in the seed stores, have each a tuft of silky hairs. It flourishes in New York and New England on dry soil if protected during the winter.

ZAVAL'LA, a co. of s. Texas, drained by the Nueces and Rio Leona; 1200 sq.m.; pop. '90, 1097. The surface is nearly level, and the land mostly uncultivated. It was created in 1858 and organized in 1884. Co. seat, Batesville.

ZE'A (ancient *Ceos*), an island of the Grecian archipelago, one of the Cyclades, 13 m. e. of cape Colonna, 14 m. in length, and 8 in greatest breadth. It is somewhat egg-shaped. Its surface rises from the coast in terraces, culminating in the center in Mt. St. Elias, whose lat. is 37° 37′ n., and long. 24° 21′ east. The climate is healthy, and the soil fertile. The products are wine, fruit, barley, cotton, and silk. Attention is paid to the rearing of cattle and silkworms. Pop. '81, 3863. Pliny says that Zea was once united to Eubœa, but that four-fifths of it were carried away by the sea. Zea was the birthplace of the lyric poets Simonides and Bacchylides. The island once possessed four towns, but there is now only one, *Zea*, situated on the n.w. slope of the hill, about

3 m. from the coast, on the site of the ancient *Iulis*, of which the most important remain is a colossal lion, about 20 ft. in length, lying a short distance e. of the town. A few remains are also still to be found on the sites of the other three ancient towns. The harbor of Zea, Port St. Nicholas, about 3 m. from the town, admits the largest vessels, and is well frequented.

ZEA. See MAIZE.

ZEALAND. See ZEELAND.

ZEALOTS, often called Sicarii, were followers of Judas of Galilee. They are described by Josephus as a fourth Jewish sect, distinguished from the Pharisees chiefly by their love of liberty and contempt for death. During the last days of the Jewish state they were lawless robbers, and a terror to the land.

ZEBID, a t. of Arabia, district of Yemen, on the river Zebid, 15 m. from its mouth, 115 m. s.w. of Sanaa, and 60 n. of Mocha. The town is of great antiquity, on account of which and of the dark color of the bricks of which it is built it has a somewhat gloomy appearance. Zebid is strongly fortified, being surrounded by high walls, said to be a league in circuit, flanked with numerous towers. It contains a Sunnite college. Zebid was formerly a place of much commercial importance, but it has declined into comparative insignificance, owing to the accumulation of sand in the mouth of the river. Pop. 5000.

ZE'BRA, a name sometimes given to all the striped *equidæ*, all of which are natives of South Africa, and thus including the dauw (q.v.) and quagga (q.v.); but also in a more restricted use, designating a single species, *equus* or *asinus zebra*, a native of the mountainous districts of South Africa. In the whole group the characters more resemble those of the ass than of the horse; the tail is furnished with long hairs only toward the tip, and the hind legs are without warts; the neck is full and arched, the mane stands erect. The zebra is about 12 hands high at the shoulder. It is of a light and graceful form, with slender limbs and narrow hoofs; the head light, the ears rather long and open; the ground color white, or slightly tinged with yellow; the head, neck, body, and legs striped with black, the neck and body transversely, but not regularly; the head with bands in various directions, the legs with irregular cross stripes. The zebra lives in small herds, inhabiting the most secluded spots. Its senses of sight, smell, and hearing are very acute, and the least alarm is sufficient to make a whole herd scamper off, with pricked ears and whisking tails, to inaccessible retreats among the mountains. When attacked, however, and compelled to defend themselves, zebras do it vigorously, the herd forming in a compact body, with their heads toward the center, and their heels toward the enemy, repelling even the lion and leopard by their kicks. The zebra has been domesticated, and used as a beast of burden, but generally shows a vicious and untractable disposition. The flesh is eaten by the natives and hunters of South Africa. A hybrid has been produced between the zebra and the ass.

ZEBU', one of the Philippine islands (q.v.).

ZEBU, INDIAN OX, or BRAHMAN OX, a kind of ox, very nearly allied to the common ox, of which naturalists generally regard it as a mere variety, although some think it a distinct species (*bos Indicus*). The most conspicuous distinctive character is a large fatty hump on the back, above the shoulders. The legs are also rather more slender and delicate than in the European ox. The hump attains a very great size in animals plentifully supplied with food, and not compelled to work; in those which are ill fed or hard worked, it is comparatively small. It is alleged that intermixture takes place freely with the common ox, and that there is no difference of anatomical structure, but these statements require verification. Mr. Vasey found the number of caudal vertebræ in the Zebu to be only 18, while in the common ox it is 21. The period of gestation in the Zebu is also said to be 300 days, while in the common ox it is 270. The Zebu is diffused over India, China, the Asiatic islands, Madagascar, and the e. coast of Africa. There are many breeds, differing very much in size; the largest being larger than any oxen of Europe, while the smallest are not much larger than a large mastiff. The hump of the largest breeds is said to be sometimes 50 lbs. in weight. English residents in India esteem the hump as delicious for the table. There are hornless breeds; but most of the breeds have short horns. There is a breed with two fatty humps, one placed immediately behind the other, which is common in the vicinity of Surat. The voice of the Zebu resembles the grunting of the yak, almost as nearly as the lowing of the ox. The Zebu is used in India both as a beast of draught and of burden. It is yoked in the plow. It is occasionally used for riding. It can travel from 20 to 30 m. a day. It is very gentle and docile. See illus., Ox, vol. XI.

The Brahminy or sacred bulls of the Hindus, consecrated to Siva, are all of this kind of ox. They are caressed and pampered by the people, and to feed them is deemed a meritorious act of religion. The Brahminy bull may go where he pleases; it is not lawful to beat him, even if he be eating a valuable crop, or if he enter a shop and devour the articles exposed for sale. He soon learns to despise shouting, which is the ordinary expedient to drive him away, and makes himself at home everywhere.

ZEBULON, TRIBE OF, contained at the Exodus 57,400 men; and 40 years afterwards 60,500, who were to enter Canaan. Its lot was in the north, having Asher on the w.,

Issachar on the s., and Naphtali on the north. Extending to the sea of Galilee, and to the Mediterranean, it fulfilled Jacob's prediction—"Zebulon shall dwell at the haven of the sea." It was also part of the region in which, according to Isaiah's prophecy the gospel light first shone.

ZECCHI'NO. See DUCAT.

ZECHARI'AH, called, in the book of prophecy which goes under his name, "the son of Berechiah, the son of Iddo," but in Ezra, "the son of Iddo," was born in Babylonia during the captivity, and accompanied the first band of exiles on their return to Palestine under Zerubbabel and Joshua. Very little is known of his personal history, but enough to assure us that he was a man of influence and a leader among his countrymen. He combined in himself the offices of priest and prophet. Ezra expressly ascribes to Haggai and him the merit of stirring up, by their prophetic inspiration, the patriotic enthusiasm of the Jews to complete the rebuilding of the temple. Later traditions, which are probably more or less in the line of historic fact, state that he assisted in providing for the service of the temple (various of the liturgical psalms being ascribed to him), and that he was a member of the great synagogue (q.v.).

The prophecies of Zechariah may be divided into three parts: the first (chapters i.–viii.) consists mainly of a series of visions relating to the building of the temple, the glory of the city, the removal of all abominations out of the land, etc., and winds up with a prediction that Jerusalem will become, as it were, a center of religious worship to all the world. The second (chapters ix.–xi.) threatens Damascus and Phenicia, and the cities of the Philistines with ruin; predicts that Judah will be greater than Javan (Greece), that Israel and Judah will be reunited—though almost immediately he symbolically shows the impossibility of this—and that both Assyria and Egypt will be humbled. The third part sets forth that dark times for Judah are drawing nigh, which shall be as an ordeal for the nation. After sore trial, it shall come forth thoroughly purged from iniquity, and then the Lord will appear in his glory on mount Olivet, fight victoriously against the hosts of heathendom, and compel all who are not destroyed by His wrath to worship Him at Jerusalem. A millennium of holiness will then begin: "In that day shall there be upon the bells of the horses, 'holiness unto the Lord' . . . . . yea, every pot in Jerusalem and in Judah shall be holiness unto the Lord of hosts" (xiv. 20, 21).

Numerous biblical critics, both in Germany and England, consider the first part only to be the work of Zechariah, and it cannot be denied that the internal evidence strongly favors this supposition. There is a unity, consistency, and sequency in the visionary predictions, and a harmony both of style and matter—the imagery bearing very distinctly the impress of those two master-spirits of the exile, Ezekiel and Daniel—that no candid critic can overlook, while the remaining chapters are totally unconnected in subject with what precede; contain no allusion to the post-exilian age, and speak of idols and false prophets in a way that would be utterly meaningless if applied to the times subsequent to the return from the captivity. The style also is quite different; is softer, richer, more poetical. The spirit of Ezekiel is exchanged for that of Jeremiah or the younger Isaiah. Whether these chapters are the work of one or two authors has also been elaborately discussed, the evidence being, on the whole, in favor of the latter view.

ZECH'STEIN (Ger. mine-stone), a deposit of calcareous rock which covers the Kupferschiefer, and which received this name because it must be cut through before reaching the mineral-bearing beds beneath. It is the equivalent in Thuringia of the fossiliferous limestones of Permian age of the n. of England.

ZEDEKI'AH, originally MATTANI'AH, the last king of Judah, son of the "good Josiah" by his wife Hamutal, succeeded his nephew Jehoiachin. The latter having rebelled against his master, Nebuchadnezzar, king of Babylon, was besieged in Jerusalem, and taken prisoner, after a brief reign of three months. Nebuchadnezzar bestowed the vacant throne on Zedekiah, doubtless in the expectation of securing a faithful liegeman. If so, he was mistaken. Zedekiah was a weak unwise ruler, probably incapable of political fidelity: in the phraseology of the Jewish historian, "he did that which was evil in the sight of the Lord." Forgetting his obligations to the Babylonish monarch, he lent a ready ear to the foolish braggadocia of the nobles and princes of Judah, and in spite of the earnest and reiterated remonstrances and warnings of Jeremiah, finally consummated his perfidy by forming an alliance with Egypt, the hereditary enemy of Assyria and Chaldea. Swift destruction overtook the traitor. A Babylonish army invaded and ravaged the country, besieged Jerusalem, and after inflicting a crushing defeat on an Egyptian force that was marching to the relief of the city, reduced the inhabitants to such horrible extremities that they could no longer hold out. Zedekiah, accompanied by his wives and children, fled in the darkness of night toward the Jordan, but was overtaken and made prisoner near Jericho. The monarch and his sons were sent to Riblah, at the n. end of the valley of Lebanon, where Nebuchadnezzar then abode. The conqueror, with customary Asiatic cruelty, ordered the sons to be slain before their father's face, and then deprived the wretched parent of his eyesight. Thus maimed, and bound with fetters of brass, he was conveyed to Babylon (588 B.C.), where

he probably died. The temple and city were destroyed, the inhabitants carried off into captivity, and the kingdom of David and Solomon ceased to have a place on the earth.

ZED'OARY (Arab. *Jedwar*), the name of certain species of *curcuma* (see TURMERIC), natives of the East Indies, the root-stocks (*rhizomes*) of which are aromatic, bitter, pungent, and tonic, and are used for similar purposes with ginger. They are more used in the east than in Europe, but are imported in small quantities, and sold under the name of zedoary. The ROUND ZEDOARY of the shops is the produce of *curcuma zedoaria*, a native both of India and China, having palmate root-stocks, straw-colored within. LONG ZEDOARY is produced by *C. zerumbet*, a native of various parts of the East Indies, having long palmate root-stocks, yellow within. Zedoary is a powerful sudorific.

ZEE'LAND, a province of the Netherlands, consists of the islands Walcheren, North Beveland, South Beveland, Schouwen, Duiveland, Tholen, West Flanders, and East Flanders. It lies between 51° 20′ and 51° 45′ n. lat., and 3° 21′ and 4° 15′ 54″ e. long., and has an area of 690 sq. miles. The boundaries are: South Holland on the n., the Easter Scheldt on the e., Belgium on the s., and the North sea on the w. Pop., '75, 184,215; '95, 209,546; a proportion of 304 persons to the sq. m. The provincial capital is Middelburg. Other important towns are Flushing; Goes (pron. *Huse*), in South Beveland; and Zierikzee, in Schouwen. The greatest part of the soil, which is a rich clay, has been redeemed from the sea; and almost in the center of Walcheren, South Beveland, and Schouwen, there are seen still the high mounds of earth called "hills of refuge," which the early inhabitants formed as places of safety for themselves and cattle when a high tide burst over the newly acquired lands. The number of polders (q. v.), or drained districts, in the province amounts to about 400. It is almost entirely arable, and produces the finest crops of wheat, barley, oats, rye, peas, beans, colza, beet, flax, hemp, canary-seed, mangolds, etc. Potatoes are extensively planted; and madder for the manufacture of dyeing material forms a valuable agricultural product. Horses, horned cattle, sheep, swine, and goats are the stock. In many districts of Zeeland extensive orchards beautify the farms. The fisheries employ a large portion of the population.

The neighboring seas abound with fish, and in Schouwen many eggs are collected, myriads of water-fowls resorting thither to form their nests. The principal industries, apart from agriculture, are the preparing of madder for the market, weaving calicos, rope-spinning, ship-building, beer-brewing, soap-boiling, making vinegar, salt, starch, tobacco, tile and brick, tanning leather, grinding corn, sawing wood, etc. The people of Zeeland are kind and hospitable, and in the country parishes are much attached to their fairs, meetings for merry-making, and other old customs, which might with advantage be given up. Few marriages take place among the agricultural portion of the population till absolutely necessary, but a case of desertion rarely occurs, as it would utterly disgrace the young man who did so.

On Oct. 15, 1866, a fine ship-canal through the island of South Beveland was opened, and takes the place of the Easter Scheldt. A railway from Flushing, through Walcheren and South Beveland, communicates with the main Belgian lines at Roozendaal, and by Breda leads to Rotterdam, Amsterdam, or Germany.

ZEISBERGER, DAVID, 1721–1808; b. Zanchtenthal, Moravia; educated by the Moravians of Saxony, and lived at their settlement, Nerrendyk, Holland; went thence to England; by the aid of Gen. Oglethorpe, joined his parents, who had emigrated to Georgia several years before; went n. and was one of the founders of Bethlehem, Penn., 1740; became a missionary, laboring among the Delawares at Shamokin, and the Iroquois at Onondaga, till the breaking out of the war, 1754; the war having closed he led the Christian Indians, who had fled to Philadelphia, to Wyalusing, on the Susquehanna; established a church among the Monseys on the Alleghany, 1767; going further into the wilderness in 1772 he laid out the town Schoenbrunn, on the Tuscarawas, Ohio, and was afterward joined by all the Moravian Indians of Pennsylvania. The settlements were destroyed in 1781 by a band of Wyandotte warriors, and the Christian Indians removed to Sandusky, many of whom were treacherously murdered by some white settlers. The converts being now dispersed, Zeisberger, with a small remnant, went to what is now Michigan, 1782; went in 1786 to lake Erie and founded New Salem; emigrated to Canada, 1791, and founded Fairfield; returned with some of his converts to Ohio, congress having granted them land in 1798, and built a new station, calling it Goshen. There he preached till the close of his life. He published several works in the Indian languages.

ZEITHUN, a t. and district in the highlands of Cilicia, lying in 37° to 38° n. lat. and 34° to 35° e. long., inhabited by a community of Armenian Christians, virtually independent of the Turkish government, and forming in fact an Asiatic republic. Zeithun lies in the upper basin of the Jyhun or Pyramus, where that river crosses the Taurus mountains in descending from the table-land of Asia Minor to the low plain of Cilicia, which surrounds the n.e. corner of the Mediterranean sea. It is surrounded on all sides by inaccessible crags, except on the e., where it is bounded by the deep channel of the Pyramus. The hills are covered with magnificent pines, plane trees, and evergreen oaks. Springs and brooks, never dried up during the summer, irrigate the meadows in all directions; but the *soil*, although abounding in patches of great fertility, does not produce

grain in sufficient quantity to supply the wants of the inhabitants. The mulberry trees are, however, numerous in the orchards, and give constant occupation to the women in feeding silk-worms. The men are chiefly engaged in smelting and manufacturing the iron supplied by the mountains into plowshares, horse-shoes, nails, etc., which they exchange for corn and other articles at Marash and Kaisariyeh. The language of Zeithun is a rude dialect of Armenian, in which the only literature consists of popular songs not committed to writing. Education is much neglected among children, who, except when intended for the priesthood, are not sent to school after the age of 10 or 12. The inhabitants, like the kindred race in Armenia, are free from Asiatic vices. They resemble Europeans in their respect for women.

ZEITZ, a t. of Prussia, province of Saxony, in the government of Merseburg, 23 m. s.s.w. of Leipsic, lies in a pleasant and fruitful district, on a steep slope, on the right bank of the White Elster, over which there is a stone bridge. The town is very old, and has some good old public buildings; a cathedral and four other churches; a good library, containing 20,000 vols. besides MSS.; asylums for orphans and lunatics, an old and new castle, etc. There are manufactures of cotton, earthenware, carriages, machinery, pianos, cigars, leather, calicos, hosiery, gloves, etc.; several print-fields, breweries, and distilleries. In the neighborhood are extensive mineral-oil works. Pop. '90, 21,680. It is a station on the Thuringian railway.

ZELLER, Eduard, a distinguished German theologian and historian of philosophy, was b. in Würtemberg in 1814, and studied theology at Tübingen and Berlin. He was one of the ablest and most pronounced of Baur's disciples (see Baur), and his call to a theological chair at Bern in 1847 was the occasion of fierce controversy and opposition from the orthodox. In 1849 he was removed to Marburg; in 1862 became professor of philosophy at Heidelberg, and in 1872 at Berlin. In later years, Prof. Z. confined himself to philosophical studies. His principal work is *Die Philosophie der Griechen* (3 vols., 1844–52; 4th ed. 1876: Eng. trans. 1875). His other works are the notable book on the Acts of the Apostles (1854), *Das Theologische System Zwingli's* (1853), his essays (*Vorträge und Abhandlungen*, 2d ed. 1875), his edition, with biography, of the works of his friend, D. F. Strauss (1874–78), *Geschichte der deutschen Philosophie seit Leibniz* (1873), and *Friedrich der Grosse als Philosoph* (1886). He resigned his professorship in 1894.

ZEMINDAR, the name given to the governors of districts or large towns in India, under the mogul rule. Many of the zemindars occupied in India a position almost similar to the dukes and counts of western Europe in the middle ages; they received from their superiors, the nahobs or provincial governors, fiefs of more or less extent, for which they paid a certain due annually, being then exempted from all other imposts whatsoever. The dues paid by the zemindars were, of course, exacted, with additions, from the ryots or cultivators, and constituted a large part of the imperial revenue. Under the British government the same system of tax-collection is continued in Bengal, the zemindars in that presidency being looked upon as the hereditary lords or proprietors of their respective districts.

ZENA'NA, a word of Persian origin, signifying that part of the domain of a native gentleman of India occupied by the women of his family. In Bengal, where is the typical zenana, the dwelling consists of two houses built each round its own court. The one on the street, where dwell the father, sons, grandsons, and great-grandsons, has large, lofty, well-furnished rooms which open to the outer air. In the rear building the first floor is for cow-sheds, storage and cook rooms; above are cells, 10 to 12 ft. square, each having one door and one small grated window opening upon piazzas, which, in one, two, or three tiers, surround the inner court. Faint breath of heaven it is which, mingled with the odors from below, reaches these rooms. The only furniture of these dismal cells, even when the appointments of the gentlemen's rooms are sumptuous, are a bedstead with a strip of mat upon it, a chest, a brass cup, and sometimes another small mat to spread on the brick floor. When a son marries he brings his little bride to his father's house, and thus sometimes 50 women, each being an only wife to some one of the male occupants of the outer house, are domiciled in the zenana. Polygamy is rare.

ZEND. See Pehlevi; Persian Language and Literature.

ZEND-AVESTA. See Avesta.

ZENGG, Senj, or Segnia, an important free port of the Austrian empire, in Croatia-Slavonia, lies on the Adriatic, 71 m. s.e. of Trieste, at the termination of the Josephine road opposite the island of Veglia. Zengg is the see of a Roman Catholic bishop, has a tolerably large and elegant cathedral, an upper gymnasium, a seminary for priests, an academy, and school of navigation; a small harbor, somewhat unsafe; and some trade in grain, honey, wax, wine, salt, tobacco, wood, fish, and cattle. Pop. 3000.

ZENITH, a word (connected with the Arabic *san*, a "point"), borrowed like *nadir* (q. v.) from the Arabic, is the name given to that point of the heavens which is directly overhead, i.e. in line with the spectator's position and the center of the earth. It is thus the upper pole of the spectator's horizon as the nadir is the under pole.

ZE'NO, a philosopher of Elea, a town of Lucania, in Italy, was a favorite disciple of Parmenides. He visited Athens, and the illustrious Pericles was one of his pupils. According to the account usually given, on his return to Elea, he joined a conspiracy to deliver his native town from the tyrant Nearchus, and on the failure of his plot, was captured, and put to the torture. On being interrogated as to his accomplices, he named the principal courtiers, and is said to have bit his tongue off, and spat it in the tyrant's face. However, the historical evidence for this account is unsatisfactory; and whether Zeno perished in his attempt or survived the tyrant is uncertain. He held the usual doctrines of the Eleatic school respecting the unity and the immutability of all things, distrust in knowledge acquired through the senses, and reliance on pure reason. He did not deny that there were phenomena or appearances, but he maintained that these were not real existences. In this he anticipated the Berkeleyan theory. But he is chiefly remarkable for having been the first to employ the style of argument known by the name of dialectics, in which error is refuted, and truth sought to be established, by the *reductio ad absurdum*—a method so skillfully employed afterward by Socrates and Plato. He devoted his great powers of argumentation to enforce the doctrines first broached by Xenophanes, and more systematically developed by Parmenides. His works were in prose, but only small fragments have been preserved.

ZENO, founder of the Stoic philosophy, was born at Citium, in Cyprus. The dates of his birth and death are uncertain. He flourished in the early part of the 3d c. B.C., and was a contemporary of Epicurus. His father was a merchant, and on his trading voyages brought home with him from Athens some writings of the Socratic school. By these, Zeno is said to have been attracted to the study of philosophy. At the age of 30 he was shipwrecked off the coast of Athens, and, having lost his property, he willingly adopted the Cynic doctrines, in which contempt for riches is conspicuously taught. He attached himself first to Crates, but soon became dissatisfied with the coarse, ostentatious disregard for established usages, and the indifference to speculative inquiry, which characterize the Cynic sect. He next joined the school of the Megaric Stilpo, and there became a proficient in the art of disputation. Still unsatisfied, he betook himself to Polemo the academician. Having thus made himself master of the tenets of the various schools, he proceeded to open a school for himself, wherein he might show forth the result of all his inquiry, and develop his own peculiar system. See STOICS. He selected for the purpose the "Painted Porch" (*Stoa Poikile*), from which his sect has got its name, and there, till his 98th year, as is said, continued to teach those doctrines, which, in spite of serious drawbacks, inculcate that manly energy and simplicity, fortitude under suffering, and reverence for moral worth, which made disciples of so many of the noblest characters among the Romans. As a man, Zeno deserved and gained the highest respect. The Athenians honored him with a gold crown and a public burial, and his countrymen erected a monumental pillar to his honor. Of his numerous writings scarcely anything remains, save the titles.

ZENO'BIA, Queen of Palmyra, succeeded (271 A.D.) her husband Odenatus, who had been acknowledged by Gallienus as his colleague in the Roman empire. Nearly the whole of the eastern provinces submitted to her sway. When Aurelian assumed the purple, he marched against her with a large army, and after defeating her in several battles, besieged her in Palmyra. Her hopes of being relieved by the Persians and Arabians being disappointed, she attempted to escape by flight, but was captured, 273 A.D. Before the conqueror, her courage failed, and she saved her own life by imputing the blame of the war to her counselors, especially the celebrated Longinus, who was accordingly put to death. Zenobia was led in triumphal procession at Rome, decked with splendid jewels, and almost fainting under the weight of gold chains. She was presented by her conqueror with large possessions near Tivoli, where, in the society of her two sons, Heronnianus and Timolaus, she passed the rest of her life in comfort and even splendor. She was a woman of great courage, high spirit, and strikingly beautiful. With purity of morals in private life, she combined prudence, justice, and liberality in her administration. Her literary acquirements were considerable; she spoke Latin and Greek, as well as the oriental languages, with fluency. The balance of authority is said to be in favor of the belief that she was attached to the Jewish faith.

ZENTA, or SZENTA, a t. of Hungary, in the co. of Bács, on the right bank of the Theiss, 120 m. s.s.e. of Pesth, in a beautiful plain. Cattle-breeding is carried on. Pop. '90, 25,791. It is celebrated for the victory of prince Eugene over the Turks in 1697.

ZE'OLITE (Gr. *zeo*, to boil), the common name of a large group of minerals, often called the zeolitic family. They receive this name from their melting before the blow-pipe. They are all soluble in acids, and most of them gelatinize in acids in consequence of silica being set free. They are hydrated silicates of alkalies or alkaline earths, most of them containing alumina. Magnesia is rarely present in them. Their composition, however, is very various. They are generally found in amygdaloidal cavities, or in fissures of trap and other Plutonic rocks, as granite and gneiss, apparently as deposits from water percolating through the rock. They sometimes, but rarely, occur in veins. They are found either in crystals or of crystalline structure, often in plates or fine scales, often in needles or fibrous. Among them are *analcime*, *natrolite* or *mesotype*, *scolezite* or *needlestone* (*needle zeolite*), *stilbite*, *heulandite*, *brewsterite*, *apophyllite*, *chabasite*,

harmotome or *cross-stone*, and *laumonite*. The number of species and varieties which have been described and have received distinct names is very large.

ZEPHANI'AH (the name probably signifies a "watcher of the Lord"), a Hebrew prophet who flourished during the reign of Josiah, in the latter part of the 7th c. B.C. The subject-matter of his brief "prophecy" is the temporary desolation of Judæa ("I will utterly consume all things from off the land," i. 2), on account of the infidelity and worldliness of the inhabitants, Jerusalem being specially assailed by the author for her filth and pollution; the tyranny and the rapacity of her rulers, and the violence and treachery of her priests and prophets. At the same time the prophet predicts the destruction of the surrounding heathen nations, the Philistines, the Moabites, Ammonites, Ethiopia, and Assyria.

ZERBST, capital of the former duchy of Anhalt-Zerbst (see ANHALT), a t. of north Germany, in the duchy of Anhalt, 11 m. n.w. of the town of Dessau, and 68 s.w. of Berlin, is situated on a level sandy spot on the river Nuthe, a tributary of the Elbe. In place of the ancient walls, promenades now encircle the town. Close by is a beautiful large palace, the ducal residence. The town has 4 Protestant churches, a Roman Catholic one, and a synagogue. The church of St. Nicholas is a beautiful specimen of Gothic architecture. The town is the seat of a court of justice; has a high school, called the Francisceum; female, industrial, and other schools; a house of correction, and orphan asylum, hospitals, and a workhouse. The chief manufactures are articles in gold and silver, silk, wax, soap, machinery, chemicals, stoneware, carriages. There are many breweries, whose produce is exported in large quantities. The vegetable products are considerable, and the culture of hops is carried on. Handsome baths have been erected over a mineral spring recently discovered here. Pop. '90, 16,181.

ZERO, a term in thermometry applied to certain points of temperature. The centigrade zero is the temperature of melted ice. Fahrenheit put his zero at the point indicated by his thermometer in a mixture of mixed snow and salt, supposing such point to be absolute zero. The centigrade thermometer zero is the temperature of water formed by ice at the exact moment of its fusion. See THERMOMETER.

ZERRAHN, CARL, conductor, b. in Mechlenburg-Schwerin, July 28, 1826. He received his musical education in Hanover and Berlin, and came to America during the revolution of 1848. He joined the Germania Musical Society, which gave concerts in the principal cities of the United States, playing the first flute. In 1854 he was made conductor of the Handel and Haydn society, Boston. For many years he gave at his personal risk the only orchestral classical concerts in Boston. In 1865 he was appointed conductor of the Harvard Symphony concerts, serving until they disbanded in 1882. He has been conductor of the oratorio society of Salem, Mass., since 1868, and has conducted many of the principal musical festivals held in New England. Mr. Zerrahn is a noted conductor of oratorios.

ZEUGLODON, or BASILOSAURUS, an extinct mammal allied to the whale. It lived during the eocene tertiary period. Its remains have been found in Georgia, Alabama, Mississippi, and Louisiana. A vertebral column 70 ft. in length with some bones of the head, ribs, etc., was obtained by Dr. S. B. Buckley in Clark co., Ala., in 1842. It is now in the museum of the late Dr. Warren at Boston, Mass. Some of the larger vertebræ are a foot and a half long and a foot in diameter. It is one of the largest fossil animals known. In Clark co., Ala., its bones were so many, scattered over the surface, that some were burned and others placed in stone walls. See illus., TERTIARY PERIOD, vol. XIV.

ZEUS (Sanskrit, *div*, light, *djaus*, heaven, *devas*, god; Lat. *Ju-piter* and *Dies-piter*, i.e., father Zeus; Ang.-Sax. *Tiu*, whence Tuesday) was the greatest of the national deities of Greece. According to the most received mythology, he was the son of Cronos and Rhea, brother of Poseidon and Hera, the latter of whom was also his wife. He expelled his father and the older dynasty of the Titans; assumed the sovereignty of the world, and successfully resisted the attacks of the giants and the conspiracies of the gods. In the allotment of the world, after the dethronement of the Titans, Zeus gained the rule of heaven and air, Hades of the infernal regions, and Poseidon of the sea; while the earth was left subject to the influence of all three, though Zeus was regarded as having the supremacy throughout all departments. Crete, Dodona, and Arcadia were the places where the worship of Zeus was most cultivated; and although originally the inhabitants of these places may not have looked upon themselves as worshipers of the same god, yet, in process of time, all the local gods revered under the name of Zeus were at last merged in one great Hellenic divinity; a process which was carried still further out when he was identified with the Jupiter of the Romans and the Ammon of Libya.

Besides the epithets of Zeus from the seats of his worship, he had many titles applied to him from his various powers and functions, moral and physical. He was the father and king of gods and men; the protector of kings, of law and order; the avenger of broken oaths and of other offenses; he watched over the state, the assembly, the family, over strangers and suppliants; his hand wielded the lightnings and guided the stars; he ordained the changes of the seasons, and, in short, regulated the whole course of nature. All prophecy, too, was supposed to originate in him, and it was from him the

prophetic god Phœbus received his oracular gift. He dispensed, as it pleased him, both weal and woe to mortals; but whether he could control the Fates themselves is a point about which the ancients disagreed, as men have done in all ages where the question of free-will and fate is concerned. Of the many epithets applied to Zeus, perhaps the best known is the Olympian, from that Olympus in Thessaly whose summit was believed to be his residence as well as that of the other gods. His most celebrated festival was the Olympic, held at Olympia, in Elis, after the end of every fourth year.

Combined with such exalted conceptions of the majesty and power of Zeus, we find many stories current respecting his amours with mortals and immortals; he is represented as acting with caprice, anger, deceit. Probably, in many cases, an ancient Greek of average position and capacity did not view such matters with any very strong feeling of disapprobation. Others, again, as Xenophanes (q.v.), protested against the transference to the gods of human passions and failings; or, as Pindar, maintained that they would believe nothing of the gods that was discreditable to them; or, as Euripides, argued that such tales were sufficient to disprove their divinity; or, as Euhemerus, held that the local worship of Zeus, like that of other deities, was owing to the fact that divine honors were paid to deified men at the place of their burial, and that of course it was no wonder to find human actions assigned to gods who had once been human. In modern times the various myths were at one time explained as symbolical of various celestial and terrestrial phenomena, such as the apparent motion of the sun, the alternation of day and night, the changes of the seasons, and so forth. The most rational explanation is as follows: In early times, men thought and spoke of natural objects as if they were personal agents, employing names for them which were literally, not symbolically, significant. But from lapse of time, and the departure of various tribes from their original seats, in many countries the meaning of these words became obscured, and though men still used them, their real significance was forgotten, and terms which originally had expressed some process of nature were conceived to narrate some incident in the history of a person. For example, the expression that the sun follows the dawn was misunderstood, and gave rise to the myth of Phœbus pursuing the nymph Daphne, because the word Daphne was no longer understood. Such misconceptions were then, by successive ages, elaborated into myths more or less fanciful and even revolting. In this respect Zeus has fared no better, or rather much worse, than the other deities. In the same way as the Greek war-god Ares is a personage much inferior to the Latin Mars, so the serious and unimaginative Roman's conception of his majestic Jupiter Optimus Maximus (the best, the greatest) was more elevated than that conceived of Zeus by the sensuous Greek. But this might be expected from the different character of the two peoples. Except in the grander attributes of omnipotence and fatherly care of the universe, we can trace little in common; for the Jupiter of the Latin poets, as portrayed in Virgil and Ovid, is drawn entirely from Greek sources, and is merely the Zeus of Greek mythology with an altered name.

ZEUX'IS, the celebrated painter, was b. at Heraclea, probably the city of that name in Lucania. He is also styled of Ephesus, which means that he belonged to the Ionian school of painters. He flourished in the latter part of the 5th c. B.C., and was at Athens about the beginning of the Peloponnesian war. He excelled in the treatment of light and shade, in accuracy of imitation of natural objects, and in expressing the perfection of human, and particularly female beauty. This last he effected by selecting the finest models he could find for each separate part. His most famous pictures were "Zeus enthroned, with the Gods standing round;" "Helen;" "The Infant Hercules strangling the Serpents;" "The Female Hippocentaur." By the exercise of his art, he attained to great riches and fame, and, like his rival Parrhasius, was exceedingly conscious of his pre-eminence. He repeatedly presented rather than sold pictures to cities that were anxious to possess them, because he thought no money-price could pay for them. Greece was plundered of many of his masterpieces by her Roman conquerors; and one of the noblest, the "Hippocentaur," was lost on the passage to Rome. Designs on vases, sarcophagi, and other works of antiquity exist adorned with representations of the same subjects as Zeuxis painted, and probably were imitated from his productions.

ZEYST, a large village in the Netherlands, province of Utrecht, is surrounded by beautiful well-wooded estates and country-seats, the summer residences of many of the first families of Amsterdam. The industries are making soap, candles, and vinegar, brass and zinc founding, etc. On a rising ground, and surrounded by fine old trees, stands the Dutch Reformed church, built in 1180. There is also a Roman Catholic church. In 1746 a society of Moravian brethren settled at Zeyst, where they have built a separate quarter, consisting of public and private buildings, erected along the sides of two large grassy squares, called the Easter plain and the Wester. Besides the church, there is an excellent day and boarding-school, which is resorted to by children of parents belonging to various Protestant communions. The unmarried members live, the males in the brothers' house, the females in the sisters' house. Another building is set apart for widows. There are also family residences, work-shops, and warehouses. Pop. about 7100.

ZHITOMEE. See JITOMIR.

ZIEBACH, a co. in s.w. S. Dakota ; formed 1879 ; 1040 sq.m. Pop. '90, 510.

ZIEM, Félix, b. France, 1821 ; studied painting in Paris and in Italy. His pictures of subjects taken from Venice, Constantinople, and the east are much admired. Among them "The Grand Canal of Venice" and "View of the Bosporus" deserve mention.

ZIERIKZEE, an old and important town in the Netherlands, province of Zeeland, is situated in the s.e. of the island of Schouwen. It was fortified before the beginning of the 11th c., and owed its rise and prosperity to the shipping-trade and fishing. The walls have been leveled, planted with trees, and formed into shady walks. Zierikzee has two havens, the old and the new, two Dutch Reformed churches, a Lutheran, a Roman Catholic, a small dissenting church, and a Jewish synagogue. There are a grammar-school, school of design, and other excellent public schools maintained by the town. The principal means of living are trade in agricultural produce, shipping, ship-building, fishing, weaving calicoes, beer-brewing, drying madder, sawing wood, grinding corn, etc.

Zierikzee suffered severely in the contests between Flanders and Holland for the possession of Zeeland. In 1303 the Flemings besieged it with a large army, but were compelled, by count William of Holland, to retire, Aug. 10, 1304. In the long war of independence, after an obstinate defense, the Spaniards took Zierikzee, July 2, 1576. Pop. '90, 7060.

ZIETHEN, Hans Ernst Karl, Count, 1770–1848; b. Prussia ; became a soldier, and in the wars with Napoleon I., 1813–15, showed great ability as a general. He commanded a corps at Waterloo and checked Ney's advance. He afterward was at the head of the Sedan army of occupation. For his services he was made a count and commander-in-chief in Silesia.

ZIGZAG, in military science, a trench of approach against a fortress; so constructed that the line of trench may not be enfiladed by the defenders. See Siege.

ZIGZAG, a decoration characteristic of the Norman style of architecture. It consists of one or more moldings running in zigzag lines, and is used with great effect. The zigzags are employed in great profusion, and are sometimes undercut so as to be detached from the moldings.

ZILLAH, ancient *Zela*, a t. in Asiatic Turkey, in the vilayet of Sivas, about 30 m. w.s.w. of Tokat. It is built on a height, with a small flat conical hill in the center of the town, which is evidently the mound or road, of which another portion is still seen at Thyana, the construction of which was attributed to Semiramis. Scarcely any remains of antiquity are to be found here; an ugly fortress of the middle ages having usurped the place of its beautiful temple. This was the field of Julius Cæsar's battle with Pharnaces, of which he wrote "Veni, vidi, vici." There are several large khans, and manufactures of coarse cottons. Its annual fair, of 15 or 20 days, from the middle of November, was formerly frequented by 50,000 or 60,000 persons from the commercial towns of Asiatic Turkey. There are about 5000 inhabitants, almost entirely Turkish.

ZILLERTHAL, one of the principal valleys of the Tyrol, traversed by the Ziller, is about 50 m. long. Toward the s. and s.w., it is bounded by lofty glaciers; but toward the n., where it opens into the valley of the Inn, it is tolerably fertile. Among the eight secondary valleys are the Duxerthal—famous for its precipitous glaciers, 1200 feet high—and the Zemthal, both remarkable for several great waterfalls. The inhabitants of the Zillerthal, who number about 15,000, are celebrated even in the Tyrol for their handsome, well-built figures; and their fine Alpine songs are well known and appreciated in London and Paris. The chief wealth of the Zillerthal is derived from the rearing of cattle. Many cattle are exported; but, notwithstanding, the valley is not able to support its numerous population. Many of the men hire themselves out as servants for the summer, while others go about as peddlers, selling essences of herbs and gloves. The principal towns are Zell and Mairhofen. For some years, the valley has been much visited by artists, chiefly from Munich.

In recent times, the inhabitants of Zillerthal acquired considerable notoriety by a part of them leaving the Roman Catholic church, and emigrating. For a considerable time, they had been in the habit of reading the Bible, and were on friendly terms with tha Protestant church, although still attending the Roman Catholic service; but when, in 1826, the Catholic clergy began to enforce auricular confession with greater strictness, a number of them thought seriously of going over to the Protestant church. Ere long, they not only objected to the confessional, but to the worship of the saints, absolutions, masses for the soul, purgatory, etc. In 1830, they began to leave the church; and by 1832, the number of dissenters had amounted to 240. The emperor Francis, to whom, on his visit to Innsbrück in 1832, they addressed a petition regarding their religion, promised them toleration; but after considerable delay, they were told (1834) that they must either return to the Catholic faith or remove to Transylvania, where there were Protestant congregations. As the Zillerthalers could not agree to this, they formed the resolution, as the Protestants of Salzburg had once done, of seeking a refuge in Prussia. This was granted; and the Zillerthalers, who had been allowed by the

Austrian government to sell their property, set out Aug., 1837, for Prussia. In all, 399 men, women, and children arrived, Oct. 2, at Schmiedeberg, in Silesia, where they were to stay until the arrangements for their reception in Ermannsdorf were completed. The king gave them 22,500 thalers (£3,375) on their settlement, and (1839) made them a further grant of 12,500 thalers (£1,875) for a church and school. The colony received the name of Zillerthal, and in 1871 numbered over 400 inhabitants.—See *Geschichte der Zillerthaler Protestanten* (Nuremb. 1838); Rheinwald; *Die Evangelischgesinnten in Zillerthal* (4 Aufl., Berl. 1838).

ZIMB, a dipterous insect, exceedingly destructive to cattle in Abyssinia, as the tsetse (q.v.) is in more southern parts of Africa. It probably belongs to the same family, but this has not yet been ascertained. It is supposed to be the *zebub* of the Hebrew Scriptures (Is. vii. 18). Bruce describes it as very little larger than a bee, but thicker in proportion; the wings broader, and without color or spot; the head large; the upper lip sharp, having at the end of it a strong pointed hair, a quarter of an inch long; the lower lip with two similar bristles. The flight of the insect resembles that of the gadfly, and is attended with a peculiar buzzing. The zimb is found only where the soil consists of a rich black loam; but all the inhabitants of the sea-coast, along the southern shores of the Red sea, and southward beyond cape Guardafui, are compelled to remove their cattle in the rainy season to the nearest sands, in order to prevent their destruction by this pest, as well as those of more inland districts from the mountains of Abyssinia northward to the confluence of the Astaboras and the Nile. "As soon as this plague appears, and their buzzing is heard," Bruce says, "all the cattle forsake their food and run wildly about the plain till they die, worn out with fatigue, fright, and hunger." The camel, the elephant, and the rhinoceros are liable to the attacks of the zimb, as well as the ox; but the elephant and rhinoceros protect themselves by rolling in mud, which, when dry, coats them as a kind of armor.

ZIMMERMANN, Albert, b. Saxony, 1809; studied art in Munich, and in 1837 was made a professor in the Milan academy. His best pictures are landscapes, and the most famous are "The Brocken and its Witches," "The finding of Moses," and "Mountain View during a storm."

ZIMMERMANN, Johann Georg, a native of the town of Brugg, in the Swiss canton of Bern, in which his father was a senator, was b. Dec. 8, 1728. He was educated at home in the first instance, and afterward at Bern, preparatory to his going to the university of Göttingen to study medicine. This he did in the year 1747. By his countryman, the celebrated Haller, he was kindly welcomed; he became an inmate of his house, and had the advantage of his valuable aid in the prosecution of his studies. In these he displayed the utmost ardor, not content to confine himself to medicine, but aiming at a large and liberal culture. In his speciality, so great was the proficiency attained that on his taking his degree of doctor, in 1751, he published a work entitled *Dissertatio Physiologica de Irritabilitate*, which not only at the time attracted attention by its originality of view, but even now is held to be not without value. In 1752 he began to practice as a physician at Bern with every prospect of success; but shortly after, the post of public physician falling vacant in Brugg, his native place, he was induced to transfer himself thither. About this time he was married to a relation of his friend and preceptor, Haller. Despite the extensive practice he speedily acquired, with such a reputation for skill as brought patients from a great distance to consult him, he continued to cultivate other pursuits; and in 1756 he published a miscellany of prose and verse, remarkable as containing the first sketch of his treatise *On Solitude*, which afterward became so famous. In 1758 appeared his work on *National Pride*, an ingenious and able dissertation, which immediately became popular and carried the name of the writer, by translation, into nearly every country in Europe. That he did not, however, neglect his special department of study was proved in 1764 by the appearance of an elaborate work on experience in medicine (*Von der Erfahrung in der Arzeneiwissenschaft;* Zurich, 2 vols.). Of this the great value was instantly recognized, and it still continues to enjoy some portion of its first reputation. Zimmerman was now a man of European note; and among other advantageous offers made to him was that of the post of physician to the king of Britain at Hanover, with the title of aulic councilor attached to it. This he accepted; and to Hanover he accordingly went in 1768. His repute as a physician continued here to increase, and from all quarters came flocks of people to have the benefit of his advice. In 1770 he had the misfortune to lose his wife, and this distress was complicated by an attack of an internal malady, which soon after obliged him to go to Berlin to undergo a perilous operation. This was successfully performed, but did not preclude a return of the complaint some time after. His only daughter now died; and a son who survived sunk under the influence of disease into something like entire idiocy. Zimmerman, who had almost from his very boyhood had to struggle against a constitutional melancholy, became now, as it almost seemed, a confirmed and hopeless hypochondriac. From this deplorable state he was rescued for a time by a second marriage, into which his friends persuaded him; and as fruit of his revived interest in life he gave to the world, in 1784, his celebrated work On Solitude (*Ueber die Einsamkeit;* Leipsic, 4 vols. 8vo), a book which speedily became a popular favorite throughout Europe. In 1786 he was invited by Frederick the Great, then in his last illness, to attend him at Potsdam. On

going thither, he found that the case of the king was beyond the reach of his art. He remained, however, for some time; and as the result of his sojourn, he published in 1788 and 1790 two works on Frederick the Great, the manifold indiscretions contained in which involved him in much painful and acrimonious controversy. In excuse of much in the books not easily to be defended, everything seems to show that they were merely the first indications of a return of his constitutional malady in an aggravated and, as it proved, a finally intractable and hopeless form. His melancholy hallucinations continued to grow upon him, till he was at length little better than a mere maniac; and on Oct. 7, 1795, he died at Hanover. During these last sad years he had continued at intervals to write and publish; but in everything thus produced there was evident the wreck of his once brilliant faculties. As a physician, a philosopher, a man of general accomplishment, and a writer of singular power and felicity, Zimmerman was unquestionably one of the most remarkable figures of his time. Of Zimmerman on *Solitude* every one must needs have heard: it no longer retains the immense popularity it once had; but along with his more expressly medical treatises, which are of interest—if not very much now otherwise—in relation to the history and development of his profession, it must still continue for a time to perpetuate the name of its writer.—See *Zimmerman's Eigene Lebensbeschreibung* (Autobiography, Han. 1791); Tissot, *Vie de Zimmerman* (1797); Wichmann, *Zimmerman's Krankengeschichte* (1786); Bodemann, *J. G. Z.* (1878).

ZINC (Zn, eq. 32.5—new system, 65—sp. gr. 6.8), or *spelter*, as it is often called in commerce, is a hard bluish-white metal, lustrous externally, and when broken exhibits a foliaceous crystalline fracture. At ordinary temperatures it is somewhat brittle; but when heated to above 212° F. (100° C.), becomes ductile and malleable, and may be drawn out into wire or beaten into thin plates. At about 401° F. (205° C.) it again becomes brittle, and may be easily pulverized. It fuses at 806° F. (433° C.), and at a white heat may be volatilized; and if the vapor be exposed to the air, it burns very brilliantly, and is converted into oxide of zinc, which is deposited in copious white flakes. The temperature of its boiling-point is estimated by Deville at 1904° F. (1040° C.). On exposure to the air, zinc soon loses its metallic lustre and assumes a gray appearance, in consequence of its surface becoming oxidized, while the metal beneath is thus protected from further change—a property which renders this metal especially useful for many economical purposes. It has no action on water at ordinary temperatures, but if a mineral acid be present it readily decomposes water, and is employed to decompose the water of dilute sulphuric acid when hydrogen is required. Moreover, a hot solution of potash acts on zinc, hydrogen being liberated while oxide of zinc is formed and dissolved in the alkaline solution. Zinc precipitates from their solutions most of the electro-positive or basylous metals less oxidizable than itself.

This metal is never found in the native state; the chief ores from which it is extracted are noticed below.

The commercial zinc obtained by the ordinary methods of extraction usually contains a small quantity of lead, iron, and carbon, with occasional traces of arsenic and copper. In order to obtain it in a chemically pure state, a stream of sulphureted hydrogen is passed through a slightly acidulated solution of sulphate of zinc, and after the removal of any precipitate that may be found, the solution is boiled so as to expel the gas, after which the zinc is precipitated in the form of carbonate, by the addition of carbonate of soda. The carbonate is converted by ignition into oxide of zinc, which must be distilled in a porcelain retort with the purest available form of carbon, as, for example, charcoal prepared from loaf-sugar.

Zinc is commonly regarded as forming only one compound with oxygen—namely, the *protoxide of zinc*, ZnO, although it has been suggested that the film which is formed upon the surface of metallic zinc by exposure is a sub-oxide. Protoxide of zinc is obtained by heating the metal in the air, the white oxide thus obtained being formerly known as *lana philosophica*, from its woolly appearance; while it was known as *flores zinci*, or *flowers of zinc*, in pharmacy. The process of manufacturing this oxide, when it is required as a pigment, consists, as Prof. Miller remarks, "in distilling zinc from clay retorts into chambers through which a current of air is maintained. The volatilized metal burns at the high temperature to which it is exposed under these circumstances; and the oxide is deposited in a series of condensing chambers."—*Inorganic Chemistry*, 3d ed. p. 545. The pigment thus obtained is known as *zinc white*. The impure oxide of zinc, commonly known as *tutty*, is obtained from the flues of furnaces in which brass is melted. A hydrated oxide of zinc, $Zn(OH)_2$, is precipitated in a white gelatinous mass from the solution of the salts of zinc by the addition of potash or soda, but redissolves in an excess of the alkali. Oxide of zinc is readily soluble in acids, and is capable of being reduced by charcoal, but not by hydrogen. The most important salts formed by oxide of zinc are the sulphate and carbonate. *Sulphate of zinc*, or *white vitriol*, $ZnSO_4 + 7Aq$, occurs in large transparent, glistening, four-sided prismatic crystals, resembling those of Epsom salts. At a temperature a little below 212° F. (100° C.), the crystals lose six equivalents of their water of crystallization; at a somewhat greater heat, they lose their last equivalent, and previously to losing their water of crystallization, they fuse in it. This salt is readily soluble in water, requiring 2½ parts of the latter for its solution at 60° F. (15.5° C.). It is obtained in considerable quantity as a residue in the process

of obtaining hydrogen from dilute sulphuric acid and zinc; and it is prepared on the large scale by roasting and lixiviating zinc-blende or sulphide of zinc, which, when heated in the presence of air, is oxidized into the sulphate. *Carbonate of zinc* $ZnCO_3$, constitutes one of the most important of the zinc-ores—viz., the common or rhomboidal variety of *calamine*, a name which is derived from the property which this substance possesses of adhering after fusion in the form of reeds to the base of the furnace. Carbonate of zinc may be artificially prepared by precipitating a salt of oxide of zinc with carbonate of soda, when the required salt falls as a white precipitate; this is, however, not simple neutral carbonate, but a basic carbonate, having the composition expressed by the formula $2(ZnCO_3), 3(Zn(OH)_2)$. Of the haloid salts, the *chloride of zinc*, $ZnCl_2$, formerly known as *butter of zinc*, is the only one requiring notice. This salt is obtained in the anhydrous form by burning zinc in chlorine gas, and in the hydrated state by dissolving zinc in hydrochloric acid, and evaporating the solution, chloride of zinc being thus formed, while hydrogen escapes in the gaseous form. In the anhydrous state, it forms a whitish-gray, semi-transparent mass, which fuses readily, and sublimes at a high temperature. When exposed to the air, it soon deliquesces, and is soluble in water in all proportions. The watery solution has a burning and nauseous taste, and in a concentrated state acts as a powerful caustic. It may be crystallized with 1 equivalent of water from its aqueous solution; and it is soluble in alcohol. It "forms double salts with the chlorides of sodium, potassium, and ammonium; and a concentrated solution of the double chloride of zinc and ammonium, $NH_4Cl + ZnCl_2$, is much used for the purpose of removing the film of oxide from the surface of metals, such as zinc, iron, or copper, which are to be united by the operation of soldering."—Miller's *Inorganic Chemistry*, 3d ed. p. 546. With sulphur, zinc forms only one combination—viz., *sulphide of zinc*, or *blende* ZnS, which is one of the most abundant of the zinc minerals. Blende, when pure, is of a pale brown color, but it is commonly blackish from admixture with sulphide of iron. It usually occurs crystallized in rhombic dodecahedra, or allied forms, but sometimes is found in the massive state. Sulphide of zinc may be obtained artificially as a white precipitate, which, on drying, becomes yellow, by the addition of sulphide of ammonium to a solution of a zinc-salt. Zinc forms several important alloys, among which *brass* (consisting of 2 parts of copper to 1 of zinc) and *German silver* (q.v.) may be specially noticed. Prof. Miller sums up the characters of the salts of zinc as follows: "The salts of zinc are colorless; their solutions have an astringent, metallic taste, and act rapidly as emetics. They are distinguished by giving no precipitate in acid solutions with *sulphureted hydrogen*, but they yield a white hydrated sulphide of zinc with sulphide of ammonium."

Manufacture.—That the Romans were acquainted with the art of making brass—an alloy of copper and zinc—is proved by the analysis of some of their coins struck soon after the commencement of the Christian era. Yet zinc itself was not known in Europe as a distinct metal until Paracelsus described its distinctive properties in the 16th century. Probably the Roman brass was produced by smelting ores containing both zinc and copper, some of which are at the present day smelted in Sweden. Zinc, however, was brought from the east by the Portuguese long before it became an article of commerce in Europe, and is supposed to have been known and made into articles of use and ornament both in India and China from an early period.

There are several ores of zinc, but only two of much importance—viz., blende and calamine. Blende, black-jack, or sulphuret of zinc, contains, when pure, about 67 per cent of zinc, but, like most ores, it is rarely found pure. The usual composition of English blende is zinc 61, iron 4, and sulphur 33. It occurs in all the older geological formations, and is often associated with the ores of copper and tin, but most frequently with lead ore—occurring, of course, like these in veins. Blende crystallizes in the form of the rhomboidal dodecahedron. The crystals have considerable brilliancy, but their luster is waxy rather than metallic. In this country it is usually of a dark color, from the sulphuret of iron which it contains—hence the miners' name of *black-jack*. Sometimes it is sufficiently argentiferous to allow of the profitable extraction of the silver. Blende is found in Wales, Isle of Man, Cornwall, and Derbyshire. It is also found in a good many localities on the continent—Sweden, in particular, being rich in this ore.

Calamine, or carbonate of zinc, contains, when pure, 52 per cent of zinc, but it varies much in the proportion of metal which it contains on account of impurities. Its primitive crystalline form is the rhombohedron, but calamine as well as blende occurs more frequently massive than in crystals. It is usually either of a dull yellow or reddish-brown color. Like some other useful substances, calamine was formerly exported from England as ballast, through ignorance of its value. It was at one time raised to a considerable extent in Somersetshire, Derbyshire, and Cumberland, but it is chiefly the last county which produces it now. Belgium, Silesia, and Carinthia are well-known continental localities; and extensive deposits of it have been discovered on the n. coast of Spain, which are estimated to last for ages. Sardinia is also an important source.

Red oxide of zinc is found in New Jersey, where it is smelted. This is an oxide of zinc with a small quantity of oxide of manganese, which gives it its red color. Silicate of zinc, or electric calamine, is another rare ore, generally associated when found with calamine. Within recent years the United States has become the largest zinc-producing country in the world.

There are several distinct processes for the extraction of zinc from its ores, and of these the English, the Belgian, and the Silesian are the most important. The English process is as follows: The zinc ore (blende or calamine) is crushed between rollers to the size of hazel-nuts, and then roasted for about 12 hours, with occasional stirring, in a calcining furnace. The furnace in which the roasted ore is reduced very much resembles a glass-furnace. It is either circular or octagonal in form, and usually contains six pots or crucibles, made of Stourbridge fire-clay, about 3 ft. high by 2¼ ft. in their widest diameter. In the bottom of each pot there is an opening, from which a sheet-iron tube, in two pieces, descends about 8 ft., and under its open end there is a sheet-iron vessel to receive the condensed zinc. Zinc, being volatile at high temperatures, is smelted by distillation, and in the English process it is called distillation *per descensum*. An entire charge—that is, a charge for the whole six pots—consists of one ton of calcined ore mixed with a proper quantity of ground coke. When the pots are charged, their covers are fixed and luted on, the conical portion of the descending pipe being previously securely fixed and lined with fire-clay. The hole in the bottom of the pot is plugged with wood, which becomes converted into charcoal by the heat, and is then sufficiently porous to allow the zinc vapor to pass down, while at the same time it stops the descent of the coke or ore. The heat of the furnace is gradually raised, and soon produces vapor of zinc in the pots, which condenses as it descends the pipes, and drops into trays placed at the bottom of each pipe. Sometimes a tube becomes stopped by a lump of zinc, and when this happens, the furnace-man melts it with a bar of red-hot iron. It takes nearly three days to work off the above charge, which yields about 8 cwts. of zinc, and requires about 25 tons of coal for its distillation. It is necessary to watch the pots with great care while the process is going on, as any leakage usually causes much loss of zinc. The *rough zinc*, as it is called, is removed from the pans, where it accumulates in lumps, and melted in cast-iron pots. It is then well stirred and skimmed, and finally cast into ingots or cakes of the ordinary commercial size—the skimmings being worked over again with a new charge of ore.

The Belgian furnace differs greatly in its construction from the English. It consists of from 60 to 80 small fire-clay retorts, each about 3 ft. 6 in. long, by 8 in. in diameter, and set in a series of rectangular compartments, filling up an arched chamber. There is a clay nozzle or condenser attached to the front of each retort, and on the end of this nozzle there is a sheet-iron receiver for the condensed zinc, with a pit to collect the residue from the retorts. The retorts are charged with ground and roasted calamine, mixed with small coal free from sulphur. As the upper retorts receive less heat than the lower ones, they are not so heavily charged, and they are, moreover, supplied with less pure ores. At the end of every six hours the receivers are emptied of their melted zinc. In this process, a ton of ore can be smelted in 24 hours, and the yield from it is about 40 per cent of metallic zinc.

In the Silesian furnace, fire-clay retorts, about 4 ft. long by 1 ft. 6 in. in diameter, are arranged in two rows, back to back, and placed horizontally on a flat furnace bed, with a fire-place on a lower level running along between the backs of the retorts. A condensing apparatus comes away with a curve from the upper part of the front of each retort, and descends some 2 ft. below it. From this, the zinc, on condensing, drops on the ground, or into a tray placed to receive it.

With regard to the comparative merits of these three processes of smelting zinc, no very decided opinion appears to be yet arrived at by those who have the best means of judging. The Belgian process consumes the least fuel, but requires the greatest amount of labor; the English, on the other hand, is worked with the least amount of labor, but requires the most fuel; while the Silesian holds a sort of middle position between those extremes. Each, however, has minor advantages and disadvantages which the others have not. All three processes are in use in England.

Zinc, at ordinary temperatures, is a comparatively brittle metal; but about the beginning of the present century, it was discovered that, if heated to between 200° and 300° Fahr., its malleability and ductility were so increased that it could be rolled with facility into thin sheets, or drawn into fine wire. Since this was known, the uses of the metal, which formerly was only employed along with copper to make brass, have become greatly extended. In sheets, it is used for roofing, baths, water-tanks, spouting, and the like; also for covering ships' bottoms instead of copper. A considerable quantity is consumed for name-plates, for engraving upon, and for galvanic batteries. Perforated sheets with various ornamental patterns are manufactured for screens, blinds, light fences, and similar objects. As a material for casting artistic works, zinc possesses the desirable properties of having a low melting-point, and of taking a sharp impression from the mold, so as to require but little labor from the chaser; it has also considerable hardness. It has, in consequence, become a favorite material on the continent for making casts of statues, statuettes, and different kinds of ornaments.

Of late years, zinc has been applied with great success to the coating of sheet-iron for roofing and other purposes, and also for coating various kinds of iron wire, especially telegraphic wire. See GALVANIZED IRON.

The working of zinc-ore has progressed rapidly in the United States, as is evidenced by the following table of out-put beginning with 1885, The data previous to that time is valuable, but not so strictly accurate as to warrant its insertion in this connection:

Year.	Tons.	Year.	Tons.	Year.	Tons.	Year.	Tons.
1885.....	40,688	1888.....	55,903	1891.....	80,263	1894.....	74,004
1886.....	42,641	1889.....	.....	1892.....	84,082	1895.....	81,858
1887.....	50,349	1890.....	67,342	1893.....	76,255	1896.....	77,637

The following table gives the production of zinc in the world, in metric tons:

Year.	Belgium, France, and Prussia.	Upper Silesia.	Great Britain.	Spain.	Austria.	Russia (Poland).	United States.	Total.
1895.....	195,303	95,519	29,967	5,845	8,489	5,039	74,245	411,409
1896.....	205,511	97,409	26,294	6,000	9,403	6,264	70,432	421,313

Considerable zinc was exported from the United States in 1896, the total for the year amounting to 10,130 tons. Shipments of zinc ore also reached a large figure, the total amounting to 2075 tons. The principal states in the production of zinc are Illinois, Indiana, Kansas, Missouri, New Jersey, and Pennsylvania.

Medical Uses.—In its purely metallic state, zinc produces no effect upon the animal economy, but several of its compounds are very active medicines. As a matter of convenience, we shall consider these compounds alphabetically, beginning with *acetate of zinc*, a salt not considered in the article on the chemistry of this metal. It is obtained by dissolving, with the aid of heat, carbonate of zinc in a mixture of acetic acid and distilled water, filtering the liquid while still hot, and setting it aside to crystallize. In this process, the carbonic acid of the carbonate of zinc is displaced by the acetic acid, and escapes with effervescence. The salt is obtained in thin, translucent, and colorless crystalline plates of a pearly lustre, with a sharp unpleasant taste, soluble in water, from which the zinc may be precipitated, pure white, by sulphureted hydrogen, and evolves acetic acid when decomposed by sulphuric acid. The crystals contain three equivalents of water, and their composition is represented by the formula, $Zn(C_2H_3O_2)_2 + 3Aq$. Acetate of zinc is not much employed internally, but it is one of the most valuable local astringents, and is especially useful (in the form of solution of from 3 to 5 grains in an ounce of water) in the treatment of skin-diseases attended with much discharge, such as eczema, impetigo, etc., when the first inflammatory symptoms have subsided; and it forms a useful astringent in the milder form of ophthalmia. It was the active ingredient in sir Astley Cooper's celebrated injection for gonorrhœa in the third week—six grains of sulphate of zinc mixed with four fluid ounces of dilute solution of subacetate of lead, when sulphate of lead is precipitated, and acetate of zinc is held in solution. When employed as an ointment in skin diseases, from 4 to 10 grains finely powdered may be rubbed up with cold cream or simple ointment. *Carbonate of Zinc* is obtained for pharmaceutical purposes by the decomposition of sulphate of zinc in solution by carbonate of soda, when the carbonate of zinc is precipitated as a white, tasteless, inodorous powder, insoluble in water, but soluble with effervescence and without residue in dilute sulphuric acid. This preparation has been introduced as a substitute for *native calamine*, which formerly had a high reputation, but was so frequently adulterated as to render an officinal salt of known composition very desirable. Either in powder, or in the form of ointment, it forms an excellent astringent application for the treatment of intertrigo (or chafing of the skin), excoriations, and chronic skin diseases attended with much discharge. *Turner's cerate*, although not in the pharmacopœia, is in general use as a drying and healing ointment, and is one of the most popular remedies for superficial burns and sores. It is made by taking prepared calamine (or carbonate of zinc) and wax, 7½ ounces of each, and olive oil 1 pint. Melt the wax, and mix the oil with it, then remove them from the fire, and when the mixture begins to thicken, add the calamine, and stir constantly till they cool. *Chloride of zinc*, in the form of colorless opaque rods, obtained by pouring the concentrated solution into proper molds, is used in surgery as a powerful caustic in cases of cancer, fungous growths, etc. In toothache caused by caries, a minute portion of chloride of zinc introduced into the cavity of the tooth after the removal of the diseased parts, affords almost immediate relief. In consequence of its powerfully destructive properties, it should never be applied except by the surgeon. The solution of this salt, commonly known as *Burnett's disinfectant fluid*, is of much use in the sick-room or hospital ward as a deodorizing agent; as, however, it possesses strong caustic properties, great care must be taken that it is not administered internally in mistake for some other medicine. Few years pass without several fatal cases of this kind being recorded. *Oxide of zinc* is characterized in the pharmacopœia as "a soft, white, tasteless, and inodorous powder, becoming pale yellow when heated, and forming with diluted sulphuric acid a solution which gives a white precipitate with hydrosulphide of ammonia." It is employed internally with much success as a tonic in chorea and epilepsy, in which it must be given for a considerable period, and in gradually increasing doses till a scruple is taken daily. In doses of one or two grains combined with extract of henbane, it forms an admirable night-pill to check the perspiration in pulmonary consumption. Employed externally, either in the form of powder or ointment it forms a good astringent in cases of excoriation, sore nipples, intertrigo, slight ulcerations, etc. The officinal ointment containing 80 grains to an ounce of simple ointment is too strong for

ordinary cases, and is apt to *cake* upon the surface: these defects may, however, be removed by the addition of glycerine. *Sulphate of zinc* is employed as an astringent, a caustic, an emetic, and a tonic. As an astringent, it is given internally in small doses (of from half a grain to two grains, made into a pill with conserve of roses), in cases of chronic diarrhœa, chronic bronchitis, and long-standing leucorrhœa; while it is used topically as a lotion in old ulcers (from 5 to 20 grains to an ounce of water), as a collyrium in chronic ophthalmia, and as an injection in the abortive treatment of gonorrhœa (i.e., when we wish to cut short the disease before inflammatory symptoms appear). As a caustic, this salt, in its anhydrous state, and finely levigated, was strongly recommended by the late Sir James Simpson. He applied it in the form of powder; of a paste made with glycerine in the proportion of a dram of the latter to an ounce of the powder; or of an ointment consisting of two drams of prepared lard, rubbed up with an ounce of the powder. It has also been successfully used in the Dublin hospitals. Sulphate of zinc may be given in the same doses as the oxide as a tonic in cases of nervous palsy, and in the exhaustion dependent upon sexual excesses. In large doses, as from 15 to 30 grains, it operates as a safe and speedy emetic, and is preferable to all other emetics in cases of poisoning. In toxicological researches—as in Marsh's *Test for Arsenic*—great care must be taken to see that the zinc which is employed is perfectly free from arsenic, which is a not uncommon impurity.

ZINCOGRAPHY is essentially the same art as lithography (q.v.), zinc-plates being substituted for those of stone. One form of the art is described under the name of Anastatic printing (see PRINTING). A style of it, called paneiconography, brought forward by Gillot of Paris, for the purpose of reproducing, by lithographic, autographic, or typographic proof, any drawing with crayon or stump, or any engraving from wood or copper, is thus described: A plate of zinc finely polished is prepared, and if an original drawing is to be copied, it is done by the artist in lithographic crayon on this plate; autographic writing done with the crayon, lithographs, and fresh proofs of wood or copper-plate engravings, must be transferred in the usual way to the surface of the plate; and while still wet, an ink-roller is passed over, so as to give a deeper impression. Rosin very finely powdered is then sifted over, which adheres to the wet ink, and becomes consolidated, so that the superfluous powder is easily brushed off from the parts not covered with ink. The plate is next placed with its face upward in a shallow trough containing dilute sulphuric or hydrochloric acid sufficient to slightly cover it; the trough is then gently rocked, so as to make the acid flow backward and forward over the plate, and if this be continued for some time—an hour or upward—all the parts of the plate not covered with the ink and rosin are etched deep enough to be used as a relief-plate for printing from. In impressions where there are large interspaces, it is usual to saw them out; and in some cases, where it is found that the relief is not sufficiently high, the raised parts are re-inked, and again covered with the rosin, and submitted a second time to the action of the acid. Old engravings may be transferred by laying them to become damp on a board wetted with acidulated water, and then applying the ink-roller to the face of the engraving: the ink only acts upon the ink-lines of the engraving, and is repelled by the acid moisture which has been imbibed by the uncovered white spaces. A slight pressure will then easily produce a copy on the polished zinc-plate, which is perfected by the subsequent operations.

ZINGARELLI, NICOLO, 1752–1837; b. Naples; studied music at the Naples conservatory. He became chapel-master at the Milan cathedral in 1792, and at St. Peter's in 1804. Dismissed from the latter post on account of his refusal to produce a *Te Deum* in honor of the birth of the king of Rome, he was soon appointed director of the music school of San Sebastian at Naples; and in 1816 he became again chapel-master of Milan cathedral. He wrote some 40 operas and much church music.

ZINGEL, *Aspro*, a genus of fishes of the perch family, remarkable for the elongated form of the body, and for having the mouth situated under the projecting and rounded snout, also for the roughness of their scales. The dorsal fins are widely separated, and the ventral fins are large. Only two species are known: of which one, the zingel of the Danube (*A. zingel*), inhabits that river and its tributaries, attains a length of 15 in., and a weight of two or three pounds; the other (*A. vulgaris*) is found in the Rhone and its tributaries, and also in more eastern rivers, although unknown in those of the w. of France, and is only 6 or 7 in. long. Both are esteemed for the table.

ZINGIBERA'CEÆ. See SCITAMINEÆ.

ZINNIA, a genus of plants named after a German botanist, J. G. Zinn. They belong to the order *compositæ*, and there are about 12 species, indigenous to Mexico and the southern portions of our western territory. They are chiefly annuals, with opposite, sessile, entire leaves. There are numerous branches, each terminated by a single head of flowers. The best-known species is *Z. elegans*, with its different-tinted flowers (a variety being double), which has long been known as a garden flower. Other species sometimes cultivated are *Z. multiflora*, with red-purple rays, and *Z. angustifolia*, with a double variety, *Z. haageana*, having showy orange colored flowers. All these plants are easily raised from the seeds in gardens in the United States.

ZINZENDORF, NICOLAUS LUDWIG, Count von, the founder of the existing sect of the Moravian brethren, or Herrnhuters, was b. at Dresden, May 26, 1700. His father, a Saxon state minister, dying while Zinzendorf was a child, the latter was educated by

his grandmother, a learned and pious lady, the baroness von Gersdorf. Spener, the head of the Pietists, was a frequent visitor at her house, and his conversation, and the devotional exercises in which Zinzendorf took part, influenced his character while a mere child. In 1710 he went to Halle, where he spent six years, under the special care of Francke, the philanthropist. Zinzendorf founded among his fellow-pupils a religious society, to which he gave the name of the "order of the grain of mustard-seed." In 1716 he was sent by his relatives to Wittenberg, where Pietism was in less repute than at Halle; but he adhered to his early religious impressions. Two years afterward he traveled through Holland and France, everywhere endeavoring to convert the distinguished persons whom he met to his own religious views. On his return to Dresden, he was appointed a member of the Saxon state council, and married the sister of the count Reuss von Ebersdorf. But political life was little to his mind, and he returned to his country-seat in upper Lusatia. While residing there, he accidentally met a wandering carpenter, named Christian David, a member of the old sect of Moravian brethren, of whom some still remained in Moravia, professing the doctrines taught by John Huss. David described the persecutions to which the sect were exposed; and Zinzendorf invited him and his friends to settle on his estate. They accepted the proposal, and the colony received the name of "Herrnhut." Zinzendorf acted with great liberality to the settlers, and their success attracted much attention. In 1734 Zinzendorf went under a feigned name to Stralsund to pass an examination in theology, and was ordained a minister of the Lutheran church. In 1736 he was banished from Saxony, on a charge of introducing dangerous novelties in religion. He repaired to Holland, where he founded a Moravian colony, and afterward to Esthonia and Livonia, where he also founded colonies. In 1737, at the request of king Frederick-William I. of Prussia, he was ordained bishop of the Moravians. In the same year he went to London, where he was received with much consideration by Wesley. In 1741 he went to North America, accompanied by his daughter, and founded the celebrated Moravian colony at Bethlehem. The Herrnhuters, in the meanwhile, by their good conduct and industry, had won the respect of all classes in Saxony, and in 1748 Zinzendorf was allowed to return to Herrnhut. Having received authority by act of parliament to establish Moravian settlements in the English colonies of North America, he returned thither to do so. He finally settled at Herrnhut; and, his first wife being dead, married Anne Nitschmann, one of the earliest colonists from Moravia. He died on May 9, 1760. Thirty-two preachers, from all parts of the globe, accompanied the coffin to the grave. Zinzendorf was the author of more than 100 works in verse and prose. His hymns, used in worship by the Moravians, are objectionable on account of their pious indecency. The same may be said of his sermons, especially of those which refer to the Holy Ghost as a spiritual mother. His writings are often incoherent or mystical, but they abound with passages in which deep and original thought is expressed with great clearness and beauty.—There are lives of Zinzendorf by Spangenberg (1775), Varnhagen von Ense (in his *Biographische Denkmale*, 1830), and Burkhardt (1876).

ZION. Mount Zion is the name of the hill on which the s.w. part of Jerusalem, the city of David, or upper city, with the citadel of David, stood. At the present day only the n. half belongs to the city, the city wall running obliquely over the hill. On the w., and still more on the s. side, it descends steeply into the vale of Hinnom, to a depth of 300 feet. Mount Zion is 2,539 ft. above the level of the Mediterranean sea. With the prophets and poets of the Old Testament, Zion often stands for the whole of Jerusalem (also called "Daughter of Zion"), particularly in reference to the temple. See JERUSALEM.

ZIPS, a co. in n. Hungary, bordering on Galicia, Sáros, Torna, and other counties; 1388 sq. m., pop. '90, 163,291, of which the greater part were Germans and Slovaks. The surface is rugged, being traversed by a high range of the Carpathian mountains, and heavily wooded. The soil is not very fertile. Capital, Leutschau.

ZIRCO'NIUM (symb. Zr., equiv. 90) is the metallic constituent of the earth, *zirconia*, which is found in association with silica in the minerals *zircon* and *hyacinth*. The composition of zirconia is usually represented by the formula ZrO_2, but Swanberg regards zirconia not as a pure earth, but as a mixture of three; and to one of the metals, whose earths he thinks that he has isolated, he gives the name of *norium*. The sources from which zirconium is derived are so few (it being found only in Ceylon, one district of the Ural, and North Carolina), that it is unnecessary to enter into any details regarding it.

ZIRK'NITZ, or CZIRKNITZ, LAKE (Ger. *czirknitzersee*, *lacus lugeus* of Strabo), a small lake of Austria-Hungary in Carniola, about 20 m. s.s.w. of Laibach, and 30 m. e.n.e. of Trieste, in a deep valley to the s. of Mt. Javornik, and to the n.e. of Mt. Slivinza. The lake is about 6 m. long, and between 2 and 3 broad, is surrounded with numerous villages, chapels, and castles, contains four small islands—on the largest of which is built the hamlet of Ottok—and has no surface outlet. It is about 56 ft. deep in the deepest part, and is very irregular in shape. It is worthy of notice only on account of the very remarkable phenomenon of the occasional disappearance of its waters for several weeks, and even months, during which the bottom is often covered with luxurious herbage, which the peasants make into hay; sometimes also they manage even to sow and reap a

small crop of buckwheat in its deserted bed. The waters, however, are not perfectly regular in their disappearance—indeed, sometimes for five or six years together they have not retired at all—but generally they drain off in the end of August, and return, if the season be wet, in five or six weeks. It takes between 20 and 25 days to empty the lake, but the return of the waters is sudden and unexpected, its basin being refilled sometimes in 24 hours. The phenomenon is accounted for by the nature of the bed of the lake. It is composed of limestone, and, like all the Carniolaic plateau, is full of deep fissures and caverns, through which the waters disappear at irregular intervals, returning when the rain sets in. Some of these openings are 50 ft. deep, and the chief ones are known to the peasantry by particular names. They communicate with subterranean reservoirs, penetrating the interior of the surrounding mountains, through which the waters are replenished or drawn off. There are 12 of these openings which discharge water into the lake as well as draw it off, and 28 which draw it off only. Through the former of these the water pours in after rainy weather as from a spout. When the surface of the lake reaches the caverns of Velka-Karlanza and Malka-Karlanza, the waters are discharged by these into the valley of St. Canzian, and after disappearing several times, fall into the Unz, above Planina. Sometimes, however, the volume of water is so great that these caverns prove insufficient to carry it off, when the lake overflows and covers the neighboring country, sometimes submerging villages. In 1834, the lake was drained in January, and remained perfectly dry till the end of February, 1835, a circumstance without parallel since the time that any records of its history have been kept. The lake is pretty well stocked with fish, and at certain times is the resort of great numbers of waterfowl, which afford both sport and profit.—There is a small village of the same name on a small stream that falls into the n. side of the lake.

ZISKA,* or **ZIZKA,** JOHN, of Trocznov, the famous leader of the Hussites, was b. at Trocznov, in the circle of Budweis, Bohemia, about 1360. His family being noble, he became a page to king Wenceslas of Bohemia, but his gloomy and thoughtful temperament unfitted him, while yet a mere boy, for the frivolous occupations about court; so, embracing the career of arms, he served as a volunteer in the English army in France, and afterward joined king Ladislas of Poland with a body of Bohemian and Moravian auxiliaries, and greatly distinguished himself in the war against the Teutonic knights, deciding the dreadful battle of Tannenberg (in which the grand master and 40,000 knights were left dead on the field) by desperate charges at the head of his contingent. High honors were heaped upon him by the king; but the war (in which Ziska had lost his right eye) being now over, his restless spirit led him to join the Austrians against the Turks, and subsequently the English against the French; and returning to Bohemia soon after the murder of John Huss (q.v.), he became chamberlain to king Wenceslas. Ziska was an adherent of the Hussite doctrine; and the tragical fate of its apostles, and the tyrannical cruelties exercised by the imperial and papal officers on its adherents, excited in his mind the liveliest indignation and resentment. A widespread sentiment of a similar kind, originating as much from patriotic as from religious feelings, existed in the kingdom; and a powerful party was soon formed, which urged upon the king a policy of resistance to the decisions of the council of Constance. Ziska soon became prominent among the leaders of this party, and his personal influence with the king gained for it the latter's sanction to offer resistance, though the king's vacillating disposition incapacitated him from giving effect to his own honest convictions and taking open part with his subjects against their oppressors. After the outbreak at Prague (July 30, 1419), in which the violent behavior of the Catholics was avenged by the precipitation of 13 magistrates from the council windows, Ziska was unanimously chosen leader of the Hussites, and the first great religious conflict of Germany was commenced in earnest. The shock produced by news of this outbreak was fatal to Wenceslas, and his death gave more of a political character to the contest, as when his brother, the emperor Sigismund (the same who had allowed his safe-conduct to Huss to be violated), attempted by advancing an army of 40,000 men into the country to obtain the throne, his project was frustrated for a time by the Hussites, who insisted on their religious and political liberties being secured, and totally defeated his army with a hastily levied force of not more than 4,000. On the retirement of the imperialists, Ziska completed his conquest of Bohemia by the capture of the castle of Prague in 1421 (the town had been taken in the spring of 1420), and secured his hold of the country by the erection of fortresses, chief of which was that of Tabor, whence his party derived its name of *Taborites* (q.v.). The varied experience acquired by Ziska in foreign warfare was now of immense service to his party: his followers were armed with small fire-arms (then little known); and his almost total deficiency in cavalry was compensated for by the introduction of the *wagenburg* (or "cart-fort," constructed of the baggage-wagons), to protect his little army from the charges of the mail-clad knights. Numerous other inventions and ingenious contrivances mark Ziska's brief career as leader of the Hussites, and show his eminent qualities as an engineer and a general. In 1421, he lost his remaining eye at the siege of the castle of Rabi; but though now totally blind, he continued to lead on his troops to a

* It is often stated that John of Trocznov was called Ziska on account of his being "one-eyed," but this is erroneous; Ziska was the name of the family for generations before his time, nor does it signify "one-eyed" in either the Bohemian or the Polish language.

succession of victories almost unexampled in history—the list of 13 pitched battles fought by him, always with much inferior force, including only one defeat, and that so much resembling a drawn battle, that his opponents dared not molest his retreat. His greatest achievements were the rout (Jan. 18, 1422) of Sigismund's second invading army, which was driven into Moravia, and 2,000 men of it drowned in attempting to escape across the frozen Iglau; and his great victory at Aussig, over the German crusading army, commanded by Frederick the Warlike of Saxony, and the elector of Brandenburg. In the latter conflict, the furious onset of Ziska's troops was steadily sustained by the Saxons, who were choice troops, and the fanatic Hussites recoiled in astonishment at a successful resistance which they had never before encountered. Ziska, apprised of the circumstances, approached on his cart, thanked his men for their past services, adding, "and if you have now done your utmost, let us retire." Thus stimulated, they made a second charge still more furious than before, broke the Saxon array, and left 9,000 of it dead on the field. Sigismund was now convinced that the conquest of Bohemia was impossible, and after a time proposed an arrangement with the Hussites, by which full religious liberty was allowed; and Ziska, who had an interview with the emperor on the footing of an independent chief, was to be appointed governor of Bohemia and her dependencies. But the war-worn old chief did not live long enough to complete the treaty, for, while besieging the castle of Przibislav, he was seized with the plague, and died Oct. 12, 1424. He was buried in a church at Czaslav, and his iron war-club was hung up over his tomb. A foolish story was long current that, in accordance with Ziska's express injunctions, his skin was flayed off, tanned, and used as a cover for a drum, which was afterward employed in the Hussite army; in order that even when dead he might be a terror to his enemies.

The only accusation which can with justice be made against Ziska is on the ground of excessive cruelty, the victims being the monks and priests who fell into his hands. But atrocious cruelties were practiced on the Hussites, and it was not to be expected that the weaker party should set an example of moderation.

ZITHER, the cithern, the modern representative of the ancient *cithara*, is a popular and common instrument in Tyrol, and of late years has become more widely known. It is a flat stringed instrument, having a wooden frame and flat sounding-board, with brass strings. When to be used it is placed on a table or on the knees, and the strings are played by the right hand, the thumb being armed with a metallic *plectrum* to bring out the melody more prominently. Latterly a good deal of music has been composed expressly for the zither, the tone of which is clear, keen, but melodious.

ZIT'TAU, a t. of Saxony, 49 m. s.e. of Dresden, and 69 by railway, is situated near the Bohemian frontier. The town has many churches, the most notable of which is the Byzantine church of St. John, finished in 1836; a splendid court-house, one of the finest in Saxony, erected 1844; a good library of 12,000 vols.; a gymnasium, a normal, a free, an industrial, a Catholic, an infant, and other schools; several charitable institutions—as a work-house, infirmary, asylum for orphans, etc. Zittau is the center of the linen and damask manufacture of Saxony. There are also woolen manufactures, bleachfields, dye-works, paper, oil, and saw mills, and iron-foundries. Its position on the railway into Bohemia led the Prussians to make it a center of operations during the war of 1866. Pop. '80, 22,473; '90, 25,394.

ZLATOUST', or KLIUCHI (Golden Mouth), a t. of Russia in the government of Ufa, among the Ural mountains, about 150 m. n.e. of Ufa, on the river Ufa. It consists chiefly of wooden houses, and the inhabitants are mostly miners. It is the center of the iron and gold mines of the district. There is a brisk trade. There is an extensive manufactory of sword blades, which are considered the best in the empire; other articles of inlaid and embossed steel are also manufactured. Pop. '91, 21,105.

ZMEINOGORSK, or ZMIEF, a t. of Siberia, in a mountainous district of the government of Tomsk, upward of 350 m. s.w. of the town of Tomsk, on the river Smievka. The town is situated in the vicinity of one of the most productive silver-mines in Siberia, which was discovered in 1736, and belonged to the Demidoff family till 1745, when it became crown property. Since its discovery it has yielded nearly a half of all the silver produced by the Siberian mines. Pop. '91, 5899.

ZNAIM, or ZNAYM, a t. of the Austrian empire, in Moravia, on a rising ground close to the left bank of the Taja, 48 m. n.n.w. from Vienna. It is celebrated for the conflict which took place here between the French and Austrians, on June 14, 1809, in which the French were victorious (see WAGRAM). There are manufactures of leather, saltpeter, earthenware, and vinegar. Near it is a circular church, supposed to be as old as the 12th century. Pop. '90, 14,516.

ZOAN, one of the oldest cities of Egypt, on the eastern side of the Tanitic branch of the Nile. It was once the residence of the Pharaohs, and, in the Psalms, the field around it is described as the scene of God's marvelous works in the time of Moses. The destruction which Ezekiel foretold long since came upon it. The "field" is a barren waste. The royal city is a habitation of fishermen, and a resort of wild beasts and reptiles. The surrounding space, for nearly a mile square, is covered with mounds of great height and full of broken pottery. The area, within which the sacred inclosure

of the temple stood, is about 1500 ft. by 1250, surrounded with the mounds of fallen houses raised above it by successive elevations. There is a stone gateway to the inclosure which bears the name of Rameses the Great. Even in their ruinous condition the broken walls, columns, and 10 or 12 fallen obelisks attest the ancient splendor of the building to which they belonged; and with them are joined two black statues and a granite sphinx. The obelisks are all of the time of Rameses, 1355 B.C., and his name most frequently occurs; but the ovals of Osirtasen III., and of other kings also, have been found: and as his time goes back nearly to that of Joseph, the scriptural account of the antiquity of the city is confirmed. The wretched village *San* keeps barely alive the Arabic version of the name. See EGYPT.

ZOAR, one of the most ancient cities of Palestine, originally called Bela or Bala. It was one of the five cities of the plain of Jordan, and though doomed with the others to destruction, it was spared, at Lot's intercession, to afford him a refuge. In the account of the death of Moses it is mentioned as visible from Pisgah, and it was known in the time of Isaiah and Jeremiah, as appears from allusions to it in their prophecies. Its exact location is unknown. It was certainly in the vicinity of the other four cities —viz., in the "plain" or "circle" of the Jordan—and the narrative implies that it was near Sodom. As the plain of Jordan was on the n. side of the Dead sea, these cities must have been there instead of at the southern end of the lake as is commonly supposed. Eusebius and Jerome describe Zoar as having many inhabitants and a Roman garrison in their day. Stephen of Byzantium calls it a large village and fortress. It is spoken of as the seat of a bishop. The crusaders found it under the name Segor, and describe it as pleasantly situated and having many palm-trees. Abulfeda frequently mentions Zoghar as a place adjacent to the Dead sea.

ZO'BO, a hybrid between the yak (q.v.) and the common ox of India. It is not very unlike an English ox. It is common in the western parts of the Himalaya, and is valued as a beast of burden, as well as for its milk and its flesh.

ZÖCKLER, OTTO, a Lutheran theologian, b. 1833, in Grünberg, Hesse, studied at Giessen, Erlangen, and Berlin and became a professor at Giessen in 1863 and Greifswald in 1866. His works are numerous, including commentaries on Chronicles, Job, Proverbs, and *Das Kreuz Christi* (1875; translated into English in 1877); *Die Lehre vom Urstand des Menschen* (1879); *Gottes Zeugen im Reich der Natur* (1881); *Studies in the Bible and in Church History* (1893), etc.

ZO'CLE, or SOCLE, a square plain plinth under the base of a column.

ZO'DIAC (Gr. *zodiakos*, commonly derived from *zoön*, an animal), the name given by the ancients to an imaginary band extending round the celestial sphere, having as its mesial line the ecliptic or apparent path of the sun. It was fixed at about 16° in width, for the purpose of comprehending the paths of the sun and of the five planets (Mercury, Venus, Mars, Jupiter, and Saturn) which were then known; and as, of these planets, Mercury has by far the greatest inclination of orbit to the ecliptic, and the value of that element in his case is only 7° 0′ 9″, the width given to the zodiac was amply sufficient for the required purpose. But when the career of planetary discovery commenced in the beginning of the 19th c., the first three which were discovered (Ceres, Pallas, and Juno) at once destroyed the idea which had been long seated in men's minds, that no planets existed beyond the limits of the zodiac, by exhibiting orbits inclined to the ecliptic at no less angles than 10° 36½′, 34° 42⅜′, and 13° 3⅛′; and a large number since observed have been found to wander from 0° to 18° beyond the zodiac, from which circumstance they have, along with the three above mentioned, been denominated *ultra-zodiacal* planets. The stars in the zodiac were grouped into 12 constellations, to each of which 30°, or $\frac{1}{12}$th of the whole circle, was assigned, though it often did not fill up that space, but was only situated in it; and this equable division into *signs* was of great advantage in defining the positions of the sun and planets at any epoch.

The constellations, with the appropriate symbols of the corresponding signs, are as follow:

Aries (*Ram*) ♈	Libra (*Balance*) ♎
Taurus (*Bull*) ♉	Scorpio (*Scorpion*) ♏
Gemini (*Twins*) ♊	Sagittarius (*Archer*) ♐
Cancer (*Crab*) ♋	Capricornus (*Goat*) ♑
Leo (*Lion*) ♌	Aquarius (*Water-bearer*) ♒
Virgo (*Virgin*) ♍	Pisces (*Fishes*) ♓

As one half of the ecliptic is to the n., and the other to the s. of the equator, the line of intersection of their planes is a diameter of each, and the two points in which this line meets the celestial sphere are known as the equinoctial points. The comparative immobility, with respect to the ecliptic, of these points, suggested at once the employment of one or other of them as a point from which to reckon, and accordingly that point at which the sun crosses the equinoctial from s. to n. was fixed upon, and called the first point (or commencement) of Aries. After the sun had advanced eastward through this sign—i.e., 30° along the ecliptic—he entered the sign of Taurus, continuing his course onward through the others in the order in which they are given above, again crossing the equinoctial southwards at the point where he emerged from Virgo

and entered Libra. This was the case with the sun during the time of Hipparchus (q.v.), but though the equinoctial points move very slowly, yet they do so with great uniformity, and the westerly motion of 50″ annually which they describe along the ecliptic has at the present time separated the sign Aries from the constellation Aries, and caused the former to correspond almost to the constellation Pisces. This gradual retrogression of the signs through the constellations of the zodiac will continue till they accomplish, in about 25,868 years, a complete circuit; after which period the sign and constellation of Aries will coincide, as they did in the time of Hipparchus. Neither the zodiac nor its constellations are of much use now in astronomy, except as, like the other constellations, affording an easy though somewhat fantastic nomenclature for the stars, and a rude but sometimes convenient mode of reference to their positions.

The porticos of the temples of Denderah and Esne in Egypt, have representations of the zodiacal constellations, which are of great antiquity, and have formed a fruitful theme of discussion. M. Dupuis, in his *Origine des Cultes*, has, from a careful investigation of the position of these signs, and calculating precession at its usual rate, arrived at the conclusion that the earliest of them dates from 4000 B.C. This conclusion is controverted by M. Fourier, in his *Recherches sur les Sciences, etc., de l'Egypte*, who makes the representations at Esne 1800 years older than the other; but his hypothesis has been in turn overthrown by MM. Ideler and Biot. The truth seems to be that nothing is as yet definitely known respecting these ancient representations; for the manner in which the investigations have been mixed up with the Biblical question of the antiquity of man, has prevented any truly scientific research. The Greeks would seem to have borrowed their constellations from the Egyptians and Babylonians, and this is corroborated to some extent by occasional remarks in Greek writers as to the positions of various constellations at certain times, which positions are inconsistent with the supposition of the observer being in Greece. The zodiacal figures of the Hindus, ancient Persians, Chinese, and Japanese have such a remarkable resemblance to those of the Egyptians, that there can be little doubt as to their common origin.

ZODI'ACAL LIGHT is the name given to a singular appearance seen after sunset or before sunrise, at all seasons of the year in low latitudes, but rarely in this country, except in March, April, and May in the evenings, and six months later in the mornings. It is obviously due to illuminated (partly, perhaps, self-luminous) matter surrounding the sun in a very flat, lenticular form, nearly coinciding with the plane of the ecliptic, or rather with the sun's equator, and extending to a distance from the sun greater than that of the earth, since its apex is often seen more than 90° from the sun. It seems to have been first distinctly pointed out by Cassini, and was long regarded as the sun's *atmosphere*. This idea, however, is totally irreconcilable with mechanical principles; since, to assume so flat a form, in spite of the enormous attraction of the sun, and its own elasticity, an atmosphere would have to revolve with a velocity so great as to dissipate it into space. The only conceivable explanation of the phenomenon is, therefore, to be found in supposing it to consist (like the rings of Saturn) of an immense assemblage of small cosmical masses, rocks, stones, and pieces of metal, such as are continually encountering the earth in the form of aerolites or meteorites. For the dynamical stability of such a system, it is only necessary that each fragment should separately describe its elliptic orbit about the sun. The mutual perturbations of the system, on account of the enormous mass of the sun, will be exceedingly small, except in the case of actual collision; but some of the planets will have a considerable effect upon it. That this is the true explanation of the phenomenon, is now generally believed. Some very curious recent observations on the August and November meteorites of 1866 (see METEORS) have shown that these bodies move in orbits almost exactly the same as those of two known comets. The comet, then, is merely that portion of the ring of small masses, revolving all nearly in the same orbit, where the greatest number are, for the time collected: and it is possible that to the collisions, which must most frequently occur where the separate particles are most numerously grouped, are due the spectral phenomena of incandescent gases which have been observed in the heads of comets by Huggins and others. Such speculations, were this the place to pursue them, might easily be extended to the sudden production and changes of form, of the tails of comets which occur near perihelion, for there the separate masses must necessarily be much more crowded together, and their impacts must be increased both in number and violence.

ZO'ETROPE, or WHEEL OF LIFE, an optical instrument, so named from its exhibiting pictures of objects as if endowed with life and activity. Although only of late years introduced from America, under this name, the instrument itself, which is simply a cylindrical thaumatrope, was invented and made the subject of a patent so long ago as the year 1860. Mr. Peter Hubert Desvignes, the inventor, in his published specification, has very fully described various modifications of the cylindrical thaumatrope; and the instruments which, under the name of mimoscope, he contributed to the London exhibition of 1862, being furnished with pictures of exquisite artistic finish and beauty, were deservedly rewarded with "honorable mention." Mr. Desvignes also proposed a stereoscopic form of the instrument, in anticipation of the one already described under ster-

oscope (q.v.), and has employed models, insects, and other objects, instead of pictures, with perfect success. The truly marvelous results shown in this instrument depend, primarily, on the well-known fact that vision "persists" for a certain short interval of time after the occlusion of the visual ray. It follows from this principle that if a series of pictures, representing the different attitudes successively assumed by an object in completing a given movement, be presented to the eye so quickly that the visual impression of each picture shall continue until the incidence of the one next following, the object will remain constantly in view, and its various parts will appear to execute the movement delineated by the pictures. To avoid the grotesqueness of a number of groups all seen performing the same movement at the same time, Mr. Desvignes devised the thaumatrope, in which the cylinder turns upon a horizontal axis, and by means of an aperture at the bottom of a hood the sight is limited to the space occupied by a single group on the opposite side of the cylinder, and, both eyes being brought into consentaneous activity, the clearness and pleasantness of the illusion are greatly enhanced. In this arrangement, the groups are arranged, on the strips, one above another, and not side by side, as in the former; and they are perforated with apertures to correspond with those on the cylinder. As has been pointed out by Mr. Desvignes, the width of the apertures should never exceed one-sixteenth of an inch; and the exterior of the instrument should be painted mat black.

The effect of the apertures, in this regard, is twofold, they limit the *time* during which each group is pictured upon the retina; and they limit, or should be made to limit, the *quantity* of each group at any one instant so depicted. Obviously, if the view be *instantaneous* only, the group in that minute interval of time will not have moved to a *perceptible* degree, and will therefore appear stationary. It is for this reason that the apertures should be made very narrow (not exceeding one-sixteenth of an inch, as above stated), and then, the eye being placed close to them, the retinal images will not be slurred —as with wider apertures, and consequent increased motion of the pictures while under view, they would be—and the maximum of *definition* is thus attained. But, in this case, both the quantity of light reaching the eye, and the time of its operation, are insufficient, which defects can only be compensated by setting the instrument in violent motion, thus occasioning an inconveniently rapid recurrence of the retinal impressions. Instead, therefore, of letting the whole picture be seen for a *single* instant, let us increase the total time of visibility by arranging that successive small portions of the pictures shall be seen in *successive* instants. This is effected by withdrawing the eye a few inches from the aperture; for the eye being at the apex of the visual angle, the further it is removed from the aperture, the greater is the distance *within the visual angle* through which the aperture must travel; and prolonged in a like degree will be the *total time of visibility* for each picture. But here another difficulty is evoked, manifesting itself in one of the most puzzling phenomena of this curious instrument. The pictures are seen as *sensibly diminished in breadth*, the explanation of which is as follows: The longer the time of visibility, the greater will be the onward movement of the picture while under view; therefore, if the left-hand side of the picture come first into view, by the time the advance of the aperture permits of the right-hand side being seen, the latter will have progressed *toward* the left, and it will accordingly be seen relatively nearer to the left side than is its natural position. And this compression, of course, takes effect over the whole of the picture. In the exquisitely elaborate drawings prepared by Mr. Desvignes, this compression was allowed for, to the great enhancement of the effect.

Lastly, of the effects due to the pictures themselves. If the pictures on the strip be the same in number as the apertures, the pictures will either coincide with the apertures, in point of position, or will be equidistant, each from its adjacent aperture; in which case there will be no apparent shifting of the pictures either to right or left. But if there be 12 pictures and 13 apertures, the picture-interval will be greater than the aperture-interval, and only one picture on the strip can be coincident with an aperture; the rest will be situated in advance of the apertures, each succeeding one slightly more than its predecessor; and, as a consequence, seen through the apertures of the revolving cylinder, they will appear continuously to advance. The contrary will be the case, if the number of the pictures exceed that of the apertures.

There are a number of instruments which operate on practically the same principle as the zoetrope, such as the kinetoscope, vitascope, cinematograph, etc. The kinetoscope, like the zoetrope is adapted for only a single observer, while the vitascope projects its views upon a screen. The pictures in all of the modern instruments are taken by instantaneous photographic exposures on a long film. In the vitascope the film travels across the field just as in the kinetoscope, but behind it is placed an electric focussing lamp, and in front a projecting lens of short focus, which throws an enlarged image on the screen. The cinematograph is identical in principle to the vitascope, and differs from it only in some details of construction.

ZOGBAUM, Rufus F., artist and author. He was born in Charleston, S. C., August 28, 1849. At the age of 29 he became a student at the Art Students' League in New York, where he remained two years. He then went to Paris where he completed his studies under the direction of Léon J. F. Bonnat. Having a fancy for the field of warfare, he studied the great armies of Europe in field and garrison, and became known as the delineator of military subjects. In 1884 he wrote and illustrated a series of arti-

cles in *Harper's Monthly*, which attracted much attention. In 1887 he published a book containing them, with some additions, under the title of *Horse, Foot, and Dragoons*.

ZOLA, Emile, French novelist, was born at Paris in 1840, the son of an Italian engineer, who built the Canal d'Aix now called after his name. The younger Zola was educated at the Lycée St. Louis, and on leaving that institution secured a position in a library. At the age of twenty-four he entered the field of literature by publishing the *Contes à Ninon* (1864), followed in 1865 by *La Confession de Claude*, a work that attracted some attention, as did his numerous articles in the *Figaro, Vie Parisienne, Petit Journal* and other popular publications. Between 1865 and 1867 he produced *Le Voeu d'une Morte* (1866), *Mes Haines*, a collection of literary disquisitions, *Les Mystères de Marseille* (1867), and *Manet*, a biographical sketch. In the same year, his first genuine success appeared in the powerful novel *Thérèse Raquin* which at once gave Zola a definite place among the leading writers of the day. It is a gloomy and repellant work, showing all the power of analysis and minuteness of observation that characterize his later work; and has been tersely summed up by Vapereau as "adultery seeking safety in murder and finding only agony and remorse." Following this, came *Madeleine Ferat* in 1868, and finally in 1871, *La Fortune des Rougon*, the first of the wonderful series entitled *Les Rougon Macquart: Histoire Naturelle et Sociale d'une Famille sous le Second Empire*. This series aims to do for the latter half of nineteenth-century France, what Balzac did for the first half. Zola has summed up his purpose in the following words:

"I desire to explain how a single family, a little group of human beings, comes into relations with society at large, as it increases by begetting and giving birth to ten or twenty individuals who, though at first sight they seem quite dissimilar, when analyzed show how closely they are bound together; for heredity has its laws as well as mathematics. . . . The members of the Rougon-Macquart family, this one group that I propose to sketch, have as a family trait the gnawing of lust, of appetite, that rushes to its satisfaction. . . . Historically, they are a part of the people; they make themselves felt by contemporary society, and they rise to all spheres of life by that impulse, so truly modern, which the lower classes feel; and they explain thus the Second Empire by their individual histories." The works that have already appeared in this series are, *La Fortune des Rougons*, showing the rise of the family in a petty provincial town; *La Curée*, wherein the scene shifts to Paris; *Le Ventre de Paris*, a study of the low life of the Halles, a marvellous bit of local color; *La Conquête de Plassans; La Faute de l'Abbé Mouret*, a not very probable tale; *Son Excellence Eugène Rougon*, a strong picture of the court of the Third Napoleon, in which the character of Rougon is drawn from that of Napoleon's minister, Rouher; *L'Assommoir*, a tremendous piece of realism, and the one that first made Zola famous outside of France: *Une Page d'Amour; Nana* (1880), the life of a courtesan under the second empire; *Pot-Bouille*, a study of bourgeois-life (1882); *Au Bonheur des Dames* (1883); *La Joie de Vivre* (1884); *Germinal* (1885), one of his greatest works; *L'Œuvre* (1886), a rather dull book; *La Terre* (1888), a repulsive picture of the crudities of French agricultural life; *Le Rêve* (1888); *La Bête Humaine* (1890), a psychological story of homicidal mania; *L'Argent* (1891); *La Débâcle* (1892); and *Le Docteur Pascal* (1893).

The most powerful of the series are *L'Assommoir, Nana*, and *Germinal;* and of these, perhaps the second is that in which the author's original purpose is most faithfully and vividly worked out. An American critic has very admirably sketched its motive in the following passage: "In Zola's narrative, Nana, and the class of courted hetairæ which she typifies, is conceived as some fair ogress, into whose yawning and fatal cave multitudes of men in hurried and endless procession descend and are engulfed. There is room for all grades and ranks of the social hierarchy, from the Prince of Wales, who figures in the tale under the thin disguise of the Prince of Scotland, to the rudest athlete or contortionist whose salient muscles have provoked a moment's caprice. It is merely indispensable that each shall bring an offering of some kind in his hand. He that cannot defray the charge of the establishment, may pay the dressmaker; another shall furnish pin money; another trinkets and bouquets. There is a certain breadth and grandeur in her insatiate greed and comprehensive harlotry; her net drags great and small; she seems to have infected a whole city. Zola regards her triumph as a kind of hideous retribution inflicted by the crushed, mud-stained rabble, from which she sprang, on the sumptuous and insolent plutocracy. She had grown like a rank weed, he says, amid the garbage of the Parisian pavement; she has the gorged luxuriance of a plant whose turgid leaves betray the compost bed; with the superb curves of her soft flesh, she avenges the beggars and outcasts who gave her birth. With her, the cesspool which *L'Assommoir* had shown us fermenting among the poor, strikes upward and permeates the social mass, befouling and cankering the idle and affluent. She becomes a malignant force of nature, a pestiferous yeast, tainting and disintegrating Paris, turning it sour like curdled milk. In one chapter she is compared to a gold-spangled horse-fly, spawned from ordure, hovering above the carrion that lies rotting by the way-side, sucking venom from its putrescence, and poisoning the wayfarer, whose cheek it brushes with its fetid wing. Elsewhere in the volume she is pictured in her gorgeous dwelling, heaped with aimless, tasteless riches, as standing erect, arrogant, sphinx-like, with a drove of worshipers rooting, swine-like, at her feet. Like those antique monsters, says the author, whose redoubtable domain was strewn with bones, her heel rested upon skulls, and catastrophes environed her. At length the task of ruin and death is com-

pleted ; wretchedness has spent its store of venom ; Nana has exacted blood money for her bruised and smarting kindred ; the beggar and the outcast are avenged."

Besides the Rougon-Macquart series, M. Zola has published *Capitaine Burle* (1882); *Naïs Micoulin* (1883); *Un Rêve* (1888), an idyllic story in striking contrast to his other works, and written to aid his candidacy for a seat in the French Academy ; *L'Argent* (1891), and a number of critical sketches and papers of which, beside *Mes Haines*, already mentioned, we may note *La République Française et la Littérature* (1879); *Le Roman Expérimental* (1880); *Les Romanciers Naturalistes*, originally published in Russian in the *Messager d'Europe* (1881), and criticising the writers of the naturalistic school, Stendhal, Balzac, Flaubert, the Goncourts, and Daudet; *Nos Auteurs Dramatiques* (1881), *Le Naturalisme au Théâtre* (1881); *Études et Portraits* (1881), containing criticisms of Hugo, de Musset, George Sand, Dumas, and Sainte Beuve; *Une Campagne* (1882), partly literary and partly political; besides several dramatic pieces which are occasionally dramatizations of his novels. Among these are *Thérèse Raquin* (1875), *Les Héritеurs Rabourdin* (1874); *Le Bouton de Rose* (1878); *Renée* (1887); *Le Ventre de Paris* (1887). Zola's *L'Assommoir* was dramatized in English by Charles Reade under the title *Drink*, and made a most effective play with Mr. Charles Warner in the rôle of Coupeau. Our author was a candidate for a chair in the French Academy in 1888, and again in 1891, but both times failed of an election. In 1894 he published *Lourdes* and in 1896 *Rome*.

M. Zola must be credited with having founded a school, and one that has strongly influenced contemporaneous fiction. Its history and tendency are sufficiently set forth in the article Realism and Naturalism. See also French Language and Literature. The reader is also referred to Hazeltine's *Chats about Books* (1884), Moore's *Impressions and Opinions* (1891) ; and Saintsbury's *Essays on French Novelists* (1891)

ZOLL'VEREIN (Ger., meaning "customs-union"), a union of different independent German states, under the leadership of Prussia, so as to enable them, in their commercial relations with other countries, to act as one state. When, after the war of liberation in 1815, the political union, destroyed by the downfall of "the holy Roman empire," had been restored to a certain degree in the German "bund" (see Germany), internal commerce was felt to be trammeled and depressed by the collection of revenue at the frontiers of every petty state; nor was it possible, without united action, to carry out the policy in regard to foreign commerce which might be thought best for protecting and developing the native trade and manufactures. The first suggestion of such a union came from Prussia; but it took many years before an actual beginning was made, and still longer before it reached its ultimate extent, as the plan was opposed for a long time by the jealousies and special interests of many of the states.

From 1819 to 1828, only some of the minor principalities inclosed within the Prussian territories had been got to conform to the Prussian commercial system; but in 1828, Hesse-Darmstadt, and in 1831, Hesse-Cassel, gave in. This was followed, in 1833, by the accession of Bavaria, Würtemberg, the kingdom of Saxony, the principality of the same name, Schwarzburg, and Reuss; and in 1835–36, by that of Baden, Nassau, and Frankfort-on-the-Main. The adhesion of Hanover did not take place till 1851, of Oldenburg till 1852. When in 1868 Lübeck and the two duchies of Mecklenburg had joined the zollverein, its territory extended over the whole of what subsequently became the German empire, with the exception of Hamburg, Bremen, and a small part of Baden near Schaffhausen. The reichsland of Alsace-Lorraine was incorporated in 1871. The imperial constitution of April 16, 1871, recognizes and ratifies the privilege of the free ports so to remain until "they themselves demand admittance within the common customs-boundary."

The principle of the Zollverein's action was this: The whole territory embraced by the union formed commercially (in regard, at least, to countries beyond its limits) one state. The duties on exports, imports, and through transports were collected at all the frontiers of the union according to a uniform tariff (subject to some concessions, made on special grounds, to individual states); and the proceeds, after paying the expenses of collection, were divided among the members of the union in proportion to their several populations. In regard to the internal trade of the union, as the duties on articles manufactured for home consumption were different in the different states, a complicated system of drawbacks came into play, in order to put the commerce of all on an equal footing.

The treaty of union was agreed upon for a definite period of years, and was renewed from time to time; as in 1842, 1853, 1865, 1867. In the latter year much was done to simplify the relations of the various states to one another in respect of internal trade; and the administration of the Zollverein was so modified as to give to the various members of the union votes in its council and parliament proportionate to the number of inhabitants in each state.

Since the establishment of the German empire, the Zollverein has no longer a separate constitution of its own. Its council (representing governments) is merged in the federal council of the empire; its parliament (representing populations) in the reichstag. Affairs are managed on the principles adopted by the Zollverein in 1867, by permanent committees of the federal council—viz., those for customs and taxes, for trade and commerce, and for finance.

The net income of the Zollverein, which, in 1834, amounted only to 12,178,761 thalers, had risen in 1871, the last year in which the Zollverein had separate accounts, to 28,000,002 thalers (above $20,000,000).

ZONES (lat. *zona*, a girdle), portions of the earth's or of a planet's surface, chiefly in form of belts or girdles, divided by parallels of latitude which are defined by the inclination of the plane of the planet's equator to that of its orbit, or ecliptic. The plane of the earth's equator is inclined to that of its orbit, 23½°, and when the planet is at the summer solstice (21st of June), the sun's rays fall perpendicularly upon that parallel of latitude (the tropic of Cancer), which is 23½° n. of the equator. Conversely, at the winter solstice (22d of Dec.), the sun's rays fall perpendicularly upon that parallel called the tropic of Capricorn, which is 23½° s. of the equator. The belt thus defined, lying between the tropics, and having a breadth of 47° (23½x2), is called the torrid zone. Now, when the sun's rays are vertical to the tropics, and the sun always pours his vertical rays over some portion of it, they will be tangent to certain parallels (polar circles) lying 23½° from the poles, throwing that portion of the earth's surface bounded by one of these circles into shadow, and continually shining upon that portion bounded by the other. These circles define the boundaries of the frigid or polar zones. Lying between these and the torrid zone there are, therefore, two belts (one in each hemisphere) bounded by the tropics and the polar circles, each 43° in breadth, called respectively the n. temperate and s. temperate zone. Over some portion of their surfaces the sun always shines, but never vertically. The zones, therefore, are not bounded by arbitrary but by natural fixed lines, although in the ordinary, non-geometrical sense, they are imaginary. Connected with these natural divisions of the earth's surface are the phenomena of the seasons and climate, and of length of day and night. See SOLSTICE, SEASONS, and CLIMATE. Let us consider here the zones of a planet whose equatorial inclination is much less than the earth's. The inclination of the plane of Jupiter's equator to that of his orbit is only 3°; consequently, the tropics defining the torrid zone, that belt is only 6° wide, and the frigid zones each the same, while the temperate zones are each 84° in breadth. This condition is theoretical. Practically, if Jupiter received most of its present heat from the sun, as the earth does, and had real seasons, and supported life, there would be a series of sub-torrid and also of sub-frigid zones lying on either side of the really temperate zones. The length of day and night varies but little on Jupiter except near the poles, at which points the days and nights are alternately six of our years long, the planet making its revolution round the sun in twelve of our years, but the nights cannot be dark. The seasons, if there were any practically, would vary but little in one latitude. There would be continual summer within, and to a considerable distance beyond the tropics; continual spring further beyond, and still further continual winter.

ZOOLOGICAL STATIONS, places on the sea-coast at which institutions have been erected and furnished with all apparatus helpful in the study of zoology. The first establishment of this kind, which owed its realization to the labors mainly of A. Dohrn, was the spacious "Stazione Zoologica," founded at Naples, 1872, and opened, 1874. It is of international character, and since 1880 has received a yearly endowment of $7500 from Germany alone. The British association makes a grant and has the use of a table here. In addition to the magnificent spaces below, stocked with various kinds of sea-inhabitants, it has rooms above for the accommodation of 50 students, provided with every desirable apparatus. Institutions of a similar kind, but on a much smaller scale, have since been set up at Trieste, Boulogne, at Concarneau (Brittany), and Marseilles at Archangel, Russia, and at Newport, R. I.

ZOOLOGY (Gr. *zōon*, an animal, and *logos*, a discourse), the science which has for its subject the animal kingdom (q.v). This science, itself a branch of natural history (q.v.), is divided into a number of branches, which are often pursued as distinct sciences, the subject being too large to be thoroughly studied except in this manner; although it is also necessary that the results of investigation in particular departments should be brought together, so that the animal kingdom may be viewed as a whole, and the relations of the most widely different groups of animals to each other determined. The number of species of animals is far greater than that of plants, and the diversity among them is also greater, so that a division of the science of zoology into branches relating to different groups very naturally takes place. Thus, the branch of zoology which has the *mammalia* for its subject has been called *mazology* (Gr. *mazon*, a teat), an unhappily chosen and essentially incorrect term, which has not come into general use; and it is a curious circumstance that this, which may be called the highest branch of zoology, has no popularly received name. It is otherwise with the branches of zoology relating to the inferior classes of *vertebrata;* that which has *birds* for its subject is universally known as *ornithology* (q.v.); that which relates to *reptiles* is *herpetology* (q.v.), and the subordinate branch relating to serpents is sometimes called *ophiology;* that which relates to *fishes* is *ichthyology* (q.v.). Among *invertebrate animals* the great group of *mollusca* is the subject of the science of *malacology* (q.v.), although this term is not in such general use as some of those already mentioned; and when shells rather than the animals which bear them are considered, the term *conchology* (q.v.) is employed. No particular term is commonly applied to the branches of zoology which treat of the *crustacea*, *arachnida*, etc.; but that which relates to *insects* is universally known as *entomology* (q.v.), and the term *helminthology* (q.v.) is employed to designate that which has *worms* for its subject. No similar terms are used for the branches of this science which relate to other groups of *invertebrata.*

The science of zoology, however, divides itself into distinct sciences, not only in accordance with the divisions of the animal kingdom, but also with regard to particular branches of the subject which may be studied either in relation to animals generally or to any particular species. Thus, *anatomy* (q.v.) may be regarded as a branch of zoology,

when the term zoology is taken in its largest sense, as including man along with the inferior animals, and *ethnology* (q.v.) must in like manner be considered as belonging to it. The anatomy of the inferior animals is sometimes called *zootomy*, and the term *comparative anatomy* is employed when their structure is studied in relation to that of man, and the structure of one division of the animal kingdom in relation to that of the others. *Physiology* (q.v.) is one of the most important branches of zoology; and with it that branch of chemistry which treats of animal substances is closely connected. A very interesting branch of zoology is that which relates to the habits and instincts of animals It can hardly be said to have been constituted into a separate science, but has received much attention from those naturalists who have devoted themselves to the study of particular groups of animals. See Animal and Animal Kingdom.

We have no evidence that the study of zoology was prosecuted to any considerable extent before the time of Aristotle. In his hands it became at once a science, and the foundations of a system of classification were laid. No artificial system of classification has ever been proposed in zoology, like the sexual system of Linnæus in botany; but from the very first to the present day a natural grouping of animals has always been attempted. To this the widely marked distinctions between the principal groups almost unavoidably led. Aristotle brought to bear upon the subject the highest powers both of observation and of generalization, and some of the groups established by him still retain their place in the most modern systems. Aristotle divided the whole animal kingdom into two great sections, the highest, *enaima*, consisting of animals having blood (i.e., red blood), and the lower, *anaima*, of animals having a colorless fluid instead of blood, the former corresponding to the *vertebrata* and the latter to the *invertebrata* of modern zoologists.

No other ancient writer deserves much notice in a historic sketch of zoology. Ælian and Pliny show no capacity for the scientific treatment of the subject, and in their writings facts are largely mingled with fables. During the middle ages zoology, like other kindred sciences, was almost completely neglected. For many centuries, the only name worth mentioning, in connection with the history of the science, is that of Albert, count of Bollstädt, commonly called Albertus Magnus; whose knowledge, however, was entirely derived from Aristotle and other ancient authors, and all he did was merely to call attention to the forgotten science, without making any contribution to its advancement. From his time, in the first half of the 13th c., to the beginning of the 16th, zoology was again almost completely neglected; but the new activity of mind which then displayed itself soon sought this as well as other directions, and an impulse was more especially given to zoology as well as to some other branches of science, by the progress of geographical discovery; curiosity being awakened with regard to the strange productions of the new world, and of the eastern and southern regions, till then equally unknown. The names of Belon (q.v.) and Rondelet are the two greatest in this department at this period, and by them zoology was enriched with many new facts, while attempts were also made at a more perfect classification. Aldrovandi and Gesner (q.v.) soon followed them, besides others who began to direct their attention more specially to particular branches of zoology, some of whom greatly extended the science by their observations on the animals of newly discovered countries. It was not till after the middle of the 17th c., however, that any real progress was made in classification, founded upon a philosophical study and comparison of animals. The works of Ray (q.v.) are described by Cuvier as "the foundation of modern zoology." The materials, however, were in great part prepared, and the first outline of a system sketched by Willughby, the friend of Ray, whom Ray long survived, and whose works he edited. From the days of Aristotle, zoology had never been prosecuted with such acuteness of observation, accuracy of description, and breadth of philosophical generalization as it was by Willughby and Ray. The progress of the science now became very rapid. Buffon won for it, by his interesting descriptions and brilliant style, the general attention of the educated portion of society, not only in his own but in other countries, and was almost immediately followed by Linnæus, who, extending his studies from botany to zoology, not only extended the science by his own observations and discoveries, but rendered it far greater service by gathering together the facts ascertained by others, and by the improvement which he effected in classification. Some of the larger groups established by Linnæus have been retained by all subsequent naturalists without essential modification of their characters, and even his smallest groups—genera—have been very generally retained, although now regarded as constituting tribes or families. According to the Linnæan system, the animal kingdom is divided into six great classes, which are further brought together in groups of two each, as follows:

Heart bilocular, with two auricles, blood warm, red.	Viviparous.	1. Mammalia.
	Oviparous.	2. Birds.
Heart unilocular, with one auricle, blood cold, red.	With lungs.	3. Amphibia.
	With gills.	4. Fishes.
Heart unilocular, with one auricle, circulating fluid (*sanies*) cold, white.	With antennæ.	5. Insects.
	With tentacula.	6. Vermes.

The orders into which Linnæus divided these classes have, in the most important instances, been already noticed, either under the classes, or separately. It was, however, in constituting and defining the genera that Linnæus showed in the highest

degree his powers both of observation and arrangement. His labors in the lower departments of the animal kingdom were much less perfect than in the higher; but others speedily entered upon the field, and while new species of animals and their habits continued to be described, the study of comparative anatomy was also diligently prosecuted, and thus preparation was made for a more complete and philosophical system of zoology. The names of Pallas, Hunter, and Blumenbach are particularly worthy to be noticed; but more than any other, the name of Cuvier, who, like Linnæus, took a comprehensive view of the whole subject of zoology, and carried forward the work of minute observation as well as of generalization. His system of classification is rather an improvement of that of Linnæus than one fundamentally new, and it has formed a new starting-point for all further progress. The divisions, the classes, and many of the orders of Cuvier's system have already been noticed under their proper heads, so that it may be enough here to give the most general outline of the system, showing Cuvier's four great divisions of the animal kingdom, and the classes which he arranges under them.

Division I. Vetebrata	Class I. *Mammalia.*
	" II. *Aves* (birds).
	" III. *Reptilia* (reptiles).
	" IV. *Pisces* (fishes).
Division II. Mollusca	Class I. *Cephalopoda.*
	" II. *Pteropoda.*
	" III. *Gasteropoda.*
	" IV. *Acephala.*
	" V. *Brachiopoda.*
	" VI. *Cirrhopoda.*
Division III. Articulata	Class I. *Insecta* (insects).
	" II. *Crustacea.*
	" III. *Arachnida.*
	" IV. *Annelida.*
Division IV. Radiata	Class I. *Echinodermata.*
	" II. *Entozoa.*
	" III. *Acalephæ.*
	" IV. *Polypi.*
	" V. *Infusoria.*

The system of Cuvier has been modified by Lamarck, Virey, Duméril, De Blainville, F. Cuvier, and others; and in consequence of the progress of scientific discovery, more considerable changes have recently been proposed by eminent naturalists, some of them amounting almost to a reconstruction of the greater part of the system; while in particular departments, and especially those which contain the lower forms of animal life, Cuvier's arrangement, regarded by himself as merely provisional, may be said to have already become completely antiquated.

A complete system of the animal kingdom has been proposed by Agassiz. He adopts the four great divisions of Cuvier, but makes much change in the subdivisions, acknowledging, however, that much is still uncertain, and that a satisfactory arrangement must depend upon anatomical and embryological researches yet to be made. The following is an outline of his system:

Division I.—Radiata.

Class I. *Polypi*	Order 1. *Actinoideæ.*
	" 2. *Halcyonodieæ.*
" II. *Acalephæ*	Order 1. *Hydroideæ* (including *siphonophoræ*).
	" 2. *Discophoræ.*
	" 3. *Ctenophoræ.*
" III. *Echinodermata*	Order 1. *Crinoideæ.*
	" 2. *Asteroideæ.*
	" 3. *Echinoideæ.*
	" 4. *Holothuridæ.*

Division II.—Mollusca.

Class I. *Acephala*	Order 1. *Bryozoa* (including the *vorticellidæ*)
	" 2. *Brachiopoda.*
	" 3. *Tunicata.*
	" 4. *Lamellibranchiata.*
" II. *Gasteropoda*	Order 1. *Pteropoda.*
	" 2. *Heteropoda.*
	" 3. *Gasteropoda* proper.
" III. *Cephalopoda*	Order 1. *Tetrabranchiata.*
	" 2. *Dibranchiata.*

DIVISION III.—ARTICULATA.

Class I. *Vermes*	Order 1.	*Trematoideæ* (including *Cestoideæ*, *Planariæ*, and *hirudinidæ*.
	" 2.	*Nematoideæ* (including *acanthocephali* and *gordiaceæ*).
	" 3.	*Annelidæ*.
" II. *Crustacea*	Order 1.	*Rotifera*.
	" 2.	*Entomostraca* (including *cirrhopoda*).
	" 3.	*Tetradecapoda*.
	" 4.	*Decapoda*.
" III. *Insecta*	Order 1.	*Myriapoda*.
	" 2.	*Arachnida*.
	" 3.	*Insecta* proper.

DIVISION IV.—VERTEBRATA.

Class I. *Myzonta*	Order 1.	*Myxinoideæ*.
	" 2.	*Cyclostomata*.
" II. *Pisces* (fishes proper)	Order 1.	*Ctenoideæ*.
	" 2.	*Cycloideæ*.
" III. *Ganoideæ*	Order 1.	*Cœlacanthiæ*.
	" 2.	*Accipenseroideæ*.
	" 3.	*Sauroideæ*.
	" 4.	*Siluroideæ*.
	" 5.	*Plectognatheæ*.
	" 6.	*Lophobranchieæ*.
" IV. *Selachia*	Order 1.	*Chimæræ*.
	" 2.	*Galeodes*.
	" 3.	*Batides*.
" V. *Amphibia*	Order 1.	*Cœcilieæ*.
	" 2.	*Ichthyodi*.
	" 3.	*Anura*.
" VI. *Reptilia*	Order 1.	*Serpentes*.
	" 2.	*Saurii*.
	" 3.	*Rhizodontes*.
	" 4.	*Testudinata*.
" VII. *Aves*	Order 1.	*Natatores*.
	" 2.	*Grallæ*.
	" 3.	*Rasores*.
	" 4.	*Insessores* (including *scansores* and *accipitres*).
" VIII. *Mammalia*	Order 1.	*Marsupialia*.
	" 2.	*Herbivora*.
	" 3.	*Carnivora*.

The three Cuvierian divisions of *vertebrata*, *mollusca*, and *articulata* have been very generally retained by systematic zoologists, without much change as to the classes or even orders of animals included in each, although it is now generally admitted that the *cirrhopoda* are not to be ranked among the *mollusca*, but, as *crustaceans*, among the *articulata;* and the *polyzoa* or *bryozoa*, formerly placed with other "zoophytes" among the *radiata*, have been removed by many naturalists to a place among the *mollusca*. Among the *radiata* of Cuvier great changes have been made; and it may be well to indicate here some of the chief of the new groups which have been proposed, and pretty generally accepted by naturalists, although their proper order and their relations to each other cannot be so well set forth as in those departments of the animal kingdom which have been more thoroughly studied. Greater importance has been assigned by recent naturalists than by their predecessors to the nervous system as a basis of classification. The lowest animals, those in which no trace of a nervous system has been discovered, have been formed into a separate division of the animal kingdom, under the names *acrita* and *protozoa* (q.v.), the latter of which has obtained general preference. Higher in organization than the *protozoa* are the *nematoneura* of Owen, having a nervous system distinctly traceable in a filamentary form, and including all the higher orders of Cuvier's *radiata*. Some groups, as *anthozoa* (see ZOOPHYTE), still occupy a doubtful intermediate place between *protozoa* and *nematoneura*. To the *articulata*, Owen has, with regard to their nervous system, given the name *homogangliata* (q.v.), and to the *mollusca* the name *heterogangliata* (q.v.). In like manner, he has recently introduced in his classification of the vertebrata the terms *hematothermal* and *hæmatocryal*, these being merely words formed from the Greek, and signifying respectively *warm-blooded* and *cold-blooded*, the former including *mammalia* and *birds*, the latter, *reptiles* and *fishes*. Further information about the recent classification of some of the lower groups of animals will be found in the article WORMS.

The system of Cuvier has been extensively modified by many subsequent anatomists; notably Lamarck, De Blainville, Ehrenberg, Owen, Milne, Edwards, Von Siebold, and by Stannius, Leuckart, Agassiz, Huxley, Hæckel, and others. The accompanying outline, while serving to give an idea of the present state of classification, must not be regarded as authoritative or final, since the rapid progress of knowledge is introducing incessant change in our conceptions of the relations of the greater groups. The reverse error must, however, be guarded against—that of supposing one classification as good as another, for each really marks a stage of progress. The taxonomy of the various groups, too, has reached a considerably greater degree of permanence. The most remarkable waves of progress in Z., since Cuvier have been due at first to the morphological impulse of Geoffrey St. Hilaire; to the prosecution, in the light of the cell-theory, of the study of the simplest forms of life, and of the minute structure of the higher animals; to the pursuit of embryology under Von Baer (q. v.) and his successors; and finally, in the highest degree, to Darwin's labors, in the regions both of observation and of theory. Influenced by the theory of evolution (see Darwinism; Man; Species; Geographical Distribution of Animals, etc.), and aided by embryology, the zoologist now seeks to arrange his forms in series which should not merely represent resemblance of adult structure, but should also indicate as nearly as possible the lines of descent by which he believes these forms to have originated. Thus various recent authors, notably Hæckel and Semper, have constructed "phylogenetic" classifications of the animal kingdom in the form of genealogical trees; but these speculations, however ingenious and suggestive, cannot supersede the existing classifications, at least while our knowledge of embryology, and more especially of palæontology, remains so imperfect; for the line of descent has been made out with apparent certainty only in the case of a few genera, such as the horse (see Mammalia) and crocodile.

I. PROTOZOA.

Section A. Monera—Class 1. Monera.
Section B. Endoplastica—Class 2. Rhizopoda; 3. Foraminifera; 4. Helioza; 5. Radiolaria: 6. Infusoria; 7. Gregarinida.

II. PORIFERA.

Class I. Myxospongiæ; 2. Fibrospongiæ; 3. Calcispongiæ.

III. CŒLENTERATA.

Class I. Hydrozoa—
Sub-class i. Hydroida.—Order 1. Hydridæ; 2. Corynidæ; 3. Sertularidæ; 4. Campanularidæ.
Sub-class ii. Siphonophora.—Order 5. Calycophoridæ; 6. Physophoridæ.
Sub-class iii. Discophora.—Order 7. Medusidæ; 8. Lacernaridæ.
Sub-class iv. Graptolitida (extinct).—Order 9. Graptolitidæ.
Class II. Actinozoa—
Sub-class i. Coralligena.—Order 1. Zoantharia; (a) Malacodermata, (b) Sclerodermata, (c) Sclerobasica; 2. Alcyonaria; 3. Rugosa (extinct).
Sub-class ii. Ctenophora.—Order 4. Ctenophora.

IV. VERMES.

Class I. Platyelmia.—Order 1. Turbellaria; 2. Nemertea; 3. Trematoda; 4. Cestoidæ.
Class II. Nematelmia.—Order I. Nematoda; 2. Gardiacea.
Class III. Acanthocephala (*Echinorhynchus*).
Class IV. Chætognatha (*Sagitta*).
Class V. Rotatoria.
Class VI. Enteropneusta (*Balanoglossus*).
Class VII. Gephyrea.
Class VIII. Annelida.
Sub-class i. Discophora.
Sub-class ii. Chœtopoda.—Order 1. Achœta; 2. Oligochœta; 3. Polychœta (*Tubicola, Errantia*).
Class IX. Polyzoa.
Class X. Brachypoda.

V. ARTHROPODA.

Class I. Prototracheata (*Peripatas*).
Class II. Myriopoda.—Order 1. Chilognatha; 2. Chilopoda.
Class III. Insecta.
Section A. Amatabola.—Order 1. Anoplura; 2. Mallophaga; 3. Thysanura.
Section B. Hemimetabola.—Order 4. Neuroptera; 5. Hemiptera; 6. Orthoptera.
Section C. Holometabola.—Order 7. Aphaniptera; 8. Diptera; 9. Hymenoptera; 10. Lepidoptera; 11 Strepsiptera; 12. Coleoptera.

Class IV. CRUSTACEA.—Order 1. Trilobita (extinct); 2. Phyllopoda, (a) Branchiopoda, (b) Cladocera; 3. Cumacea; 4. Edriophthalmia, (a) Amphipoda, (b) Isopoda; 5. Stomatopoda; 6. Copepoda; 7. Ostracoda; 8. Cirripedia; 9. Schizopoda; 10. Decapoda, (a) Macrura, (b) Brachyura.
Class V. ARACHNIDA—Order 1. Merostomata, (a) Xiphosura, (b) Eurypterida (extinct); 2. Arthiogastra; 3. Araneina; 4. Acarina; 5. Linguatulina.

VI. ECHINODERMATA.

Class I. Echinoidea; 2. Asteroidea; 3. Ophiuroidea; 4. Crinoidea; 5. Holothuroidea; 6. Blastoidea (extinct); 7. Cystoidea (extinct).

VII. MOLLUSCA.

Class I. LAMELLIBRANCHIATA.
Section A. Dimya.—Order 1. Asiphonida; 2. Siphonida.
Section B. Monomya.
Class II. POLYPLACOPHORA.
Class III. SCAPHOPODA.
Class IV. GASTEROPODA.
Section A. Prosobranchiata.
Section B. Opisthobranchiata.
Section C. Pulmonata.
Section D. Heteropoda.
Class V. PTEROPODA.
Order 1. Thecosomata; 2. Gymnosomata.
Class VI. CEPHALOPODA.
Section A. Tetrabranchiata.
Section B. Dibranchiata.—Order 1. Decapoda; 2. Octopoda.

VIII. TUNICATA.

Class I. PERENMICHORDATA (*Apprendicalaria*).
Class II. CADUCICHORDATA.
Section A. Simplicia.
Section B. Composita.
Section C. Conserta.

IX. VERTEBRATA.

A. ACRANIATA (*Amphioxus*).
B. CRANIATA.
Class I. ICHTHYOPSIDA.
Section A. Cyclostomata.
Section B. Pisces.—Order 1. Elasmobranchii; 2. Holocephala; 3. Ganoidei; 4. Teleostei, (*a*) Physostomi, (*b*) Anacanthini, (*c*) Acantopteri, (*d*) Pharyngognothi; (*e*) Lophobranchii, (*f*) Plectognathi; 5. Dipnoi.
Section C. Amphibia.—Order 1. Urodela; 2. Anura; 3. Gymnophiona; 4. Labyrinthodonta (extinct).
Class II. SAUROPSIDA.
Section D. Reptilia.—Order 1. Lacertilia; 2. Chelonia; 3. Ophidia (extinct: 4. Crocodilia; 5. Plesiosauria; 6. Ichthyosauria; 7. Dinosauria; 8. Pterosauria).
Section E. Aves.
i. Saururæ (*Archæopteryx*).
ii. Ratitæ (*Carsores*).
iii. Carinatæ.—Order 1. Natatores; 2. Grallatores; 3. Rasores, (*a*) Gallanacei, (*b*) Columbacei; 4. Scansores; 5. Insessores or Passeres, (*a*) Dentirostres, (*b*) Conirostres, (*c*) Tenurostres, (*d*) Fissirostres; 6. Raptores.
Class III. MAMMALIA.
Section i. Ornithodelphia.—Order 1. Monotremata.
Section ii. Didelphia.—Order 2. Marsupialia.
Section iii. Monodelphia (or Placentalia).—Order 3. Edentata; 4. Ungulata (*a*) Perissodactyla, (*b*) Artiodactyla; 5. Sirenia; 6. Toxodontia (extinct); 7. Dinocerata (extinct); 8. Tillodontia (extinct); 9. Hyracoidea; 10. Proboscidea; 11. Carnivora; 12. Cetacea; 13. Insectivora; 14. Rodentia; 15. Cheiroptera; 16. Primates, (*a*) Lemuridæ, (*b*) Simiadæ, (*c*) Anthropidæ.

AUTHORITIES.—GENERAL MORPHOLOGY AND CLASSIFICATION.—Linnæus, *Systema Naturæ*; Cuvier, *Règne Animal*; Lamarck, *Historie des Anim. s. Vertèbres*; Owen, *Comp. Anat. of Vertebrates*; Bronn, *Klassen u. Ordnung d. Thier-Reichs*; Huxley, *Anatomy of Vertebrated Animals* (1871) and *Anatomy of Invertebrated Animals* (1875); Claus, *Lehrb. d. Zoologie* (1882); Gegenbaur, *Introd. to Comparative Anatomy* (1875); Balfour's *Embryology* (1881). PHYSIOLOGY—Milne-Edwards, *Leçons s. la Physiologie*. DISTRIBUTION—Wallace, *On Distribution of Animals*, 2 vols. 1876. ÆTIOLOGY—Darwin's *Origin of Species* and other works. For bibliography of special subjects, see the works of Bronn, Claus, Huxley, and Gegenbaur, above cited. See also ANIMAL AND ANIMAL KINGDOM; VERTEBRATA; MAMMALIA; BIRDS; FISHES; REPTILES; and articles on the several animals.

ZO'OPHYTE (derived from the Greek *zōon*, an animal, and *phyton*, a plant, and signifying an animal-plant) is a term which was employed by Cuvier, in the same sense as he employed *radiata*—viz., to designate the lowest primary division of the animal kingdom, which includes many animal organisms that are fixed to a definite spot of rock, shell, etc., and have the form of plants. His zoophytes included the anomalous groups of *infusoria*, *entozoa*, and *radiaria*,* the latter of which was subdivided into the *hydrozoa*, *anthozoa*, *acalephæ*, *echinodermata*, and *bryozoa*.* Subsequent writers excluded the infusoria and entozoa from the zoophytes, and left only those constructed on the radiated type. These were afterward found to present extreme differences of structure, and it became obvious that the lower forms of *hydrozoa* and *anthozoa* could not be associated with the *bryozoa*, which approximate closely to the lower mollusks. The term is now never employed by scientific naturalists.

ZO'OSPORE (Gr. *zōos*, living, and *spora*, a seed), in botany, the name given to those spores (q.v.), or seeds of acotyledonous plants, which being furnished with cilia, move spontaneously for a short time after being discharged from the spore-case of the parent plant. The motions of their cilia resemble those of the cilia on the epithelium (q.v.) of the higher animals, and on the external surface of some of the lower tribes, as *acalephæ* (q.v.). In these cases in the animal kingdom, as in this case in the vegetable kingdom, there is no appearance of volition, the motion being probably owing to changes of hygrometric or of electric condition, or of both. The purpose served by the ciliary motion in zoospores is evidently the wider diffusion of the species; and the cessation of the motion after a certain time permits the seed to become fixed, in order to germination. Zoospores are found in *characæ*, *algæ*, *fungi*, and *lichens*.

ZORAH or **ZOREAH** (Heb., *Tsorah'*, a hornet), probably the modern *Sŭr'ah*, a town in Palestine, is first known to us in Joshua xv., 33, where it is mentioned as a city of Judah. It was near the southeast corner of the tribe of Dan, and was the birthplace of Samson and the residence of Manoah.

ZORILLA Y MORAL, JOSE, poet, b. Feb. 21, 1817, at Valladolid, Spain, studied law at the University of Toledo and resided for a time in Mexico. His poem read at the funeral of Larra (Spanish author) first drew public attention to him. *Don Juan Tenorio*, a religious drama (1866), is his principal work. In 1864 an edition of his poems, in two volumes, was published in Paris, France. *Ecos de las Montañas* (1868), *Lecturas Públicas hechas en el Ateno* (1877), *Recuerdos de Tiempo Viejo* (1880), and *Traidar Inconfero y Mártir* (1882), the last an historical drama in three acts, are among his productions. D. 1893.

ZORN'DORF, a village of Prussia, province of Brandenburg, was the scene of many desperate conflicts of the *Seven Years' War* (q. v.). The Russians having for the second time been ordered by the czarina Elizabeth to invade Prussia, advanced toward Berlin, commiting frightful devastations, while Frederick the Great, with the bulk of his forces, was engaged with the Austrians in Silesia and Saxony. The Russians, under Fermor, were 50,000 strong, and easily drove before them Dohna's little Prussian army of 15,000; but Frederick being speedily apprised of this new invasion, hastened northward with such a re-enforcement as raised the army to 30,000; and after taking care, by the breaking down of bridges, etc. to cut off their retreat, engaged the invaders. The battle, which commenced at eight in the morning of Aug. 25, 1758, and lasted till evening, consisted mainly in a succession of furious charges, accompanied with a tremendous artillery-fire, and was not decided till Seidlitz, by an able movement, turned the Russian flank. The Russians, now discovering that they were nearly surrounded, fought with the utmost desperation, and ultimately both armies bivouacked on the field of battle. In the morning, however, Fermor drew off his forces, diminished by 20,000 men, 103 cannon, and 27 standards; having inflicted on the Prussians a loss of 13,000 men, 26 cannon, and a few standards. Generals Soltikof, Czernitchef, and prince Sulkowski were made prisoners by the Prussians on this occasion; and, oddly enough, the first named was the conqueror of Frederick II. in the next great battle between the two northern powers, at Kunersdorf (q.v.).

ZOROASTER, or rather ZARATHUSTRA (which in Greek and Latin was corrupted into ZARASTRADES and ZOROASTRES; while the Persians and Parsees altered it into ZERDUSHT), is the name of the founder of what is now known as the Parsee religion. The original meaning of the word is uncertain, and though there have been many conjectures formed about it, yet not one of them seems to be borne out by recent investigations. Most probably it only indicates the notion of "chief," "senior," "high-priest," and was a common designation of a spiritual guide and head of a district or province. Indeed, the founder of Zoroastrianism is hardly ever mentioned without his family name—viz., Spitama. He seems to have been born in Bactria. The terms he applied to himself are either Manthran, i.e., a reciter of Manthras; a messenger sent by Ahuramazda; a speaker; one who listens to the voice of oracles given by the spirit of nature; one who receives sacred words from Ahuramazda through the flames. His life is completely shrouded in darkness. Both the Greek and Roman, and most of the Zend accounts about his life and works are legend-

*These terms have been introduced since the time of Cuvier—the former, we believe, by Owen: and the latter by Farre.

ary and utterly unhistorical. In the latter, he is to a great extent represented, not as a historical but as a dogmatical personality, vested with superhuman or rather divine powers, standing next to God, above the archangels themselves. His temptations by the devil, whose empire is threatened by him, form the subject of many traditional reports and legends. He is represented as the abyss of all wisdom and truth, and the master of the whole living creation. "We worship"—so runs one of the prayers in the Fravardin Yasht—"the rule and the guardian angel of Zarathustra Spitama, who first thought good thoughts, who first spoke good words, who first performed good actions, who was the first priest, the first warrior, the first cultivator of soil, the first prophet, the first who was inspired, the first who has given to mankind nature, and reality, and word, and hearing of word, and wealth, and all good things created by Mazda, which embellish reality; who first caused the wheel to turn among gods and men, who first praised the purity of the living creation and destroyed idolatry, who confessed the Zarathustrian belief in Ahuramazda, the religion of the living God against the devils. . . . Through whom the whole true and revealed word was heard, which is the life and guidance of the world. . . . Through his knowledge and speech the waters and trees become desirous of growing; through his knowledge and speech all beings created by the Holy Spirit are uttering words of happiness."

In the old Yasna (see AVESTA, vol. II.) alone, he appears like a living reality, a man acting a great and prominent part both in the history of his country and that of mankind. His father's name seems to have been Pourushâspa, and that of his daughter, the only one mentioned of his children, Pouruchista. Very obscure, however, remains, even by this account, the time when he lived. The dates generally given are as follows: Xanthos of Lydia places him about 600 years before the Trojan war; Aristotle and Eudoxus place him 6,000 years before Plato; others, again, 5,000 years before the Trojan war. Berosos, a Babylonian historian, makes him a Babylonian king, and the founder of a dynasty which reigned between 2200 and 2000 B.C. over Babylon. The Parsees place him at the time of Hystaspes, Darius's father, whom they identify with a king mentioned in the Shâh-Nâmeh (q.v.), from whom, however, Hystaspes is totally distinct. This account would place him at about 550 B.C. Yet there is scarcely a doubt that he must be considered to belong to a much earlier age, not later than 1000 B.C.; possibly he was a contemporary of Moses. It is almost certain that Zoroaster was one of the Soshyantôs, or fire-priests, with whom the religious reform, which he carried out boldly, first arose. These were probably at first identical with the Vedic Atharvans (fire-priests), as indeed Zoroastrianism is merely an advanced stage of Brahmanism. The former creed, that of Ahura, by way of eminence, transformed, after the outbreak of the schism, the good beings of the latter into devils or devas; e.g., the purely Brahmanic Indra, Sharva, Nâsatya, etc.—unless it promoted them into saints and angels (yagatas). The conflict that led to this schism between the Iranians and those Aryan tribes which immigrated into Hindustan proper, and whose leaders became afterward founders of Brahmanism, sprung from many social, political, and religious causes. The Aryans seem to have originally led a nomad life, until some of them, reaching, in the course of their migrations, lands fit for permanent settlements, settled down into agriculturists. Bactria and the parts between the Oxus and Jaxartes seem to have attracted them most. The Iranians became gradually estranged from their brother tribes, who adhered to their ancient nomad life; and by degrees, the whilom affection having turned into hatred, considered those peaceful settlements a fit prey for their depredations and inroads. The hatred thus nourished, by further degrees included all and everything belonging to these devastators; even their religion, originally identical with that of the settlers. The "Deva religion" became, in their eyes, the source of all evil. Molded into a new form, styled the "Ahura" religion, the old elements were much more changed than was the case when Judaism became Christianity. Generation after generation further added and took away, until Zarathustra, with the energy and the clear eye that belongs to exalted leaders and founders of religions, gave to that which had originally been a mere reaction and spite against the primitive "Brahmanic" faith a new and independent life, and forever fixed its dogmas, not a few of which have sprung from his own brains.

It is, as already said in the article on the AVESTA, chiefly from the Gâthas that Zarathustra's real theology, unmutilated by later ages, can be learned. His leading idea was monotheism. Whatever may have caused the establishment of the dualism of gods, the good and the evil in the Persian religion—a dualism so clearly marked at the time of Isaiah that he found it necessary to protest emphatically against it—it was not Zoroaster who proclaimed it. His dualism is of a totally different nature. It was merely the principle of his speculative philosophy—a supposition of two primeval causes of the real and the intellectual world. His moral philosophy, on the other hand, moved in a triad —thought, word, and deed. There is no complete system of Zoroastrian philosophy to be found in the Zend-Avesta, any more than there is a developed Platonic system laid down explicitly in the Platonic writings; but from what is to be gathered in the documents referred to it cannot be doubted that Zoroaster was a deep and great thinker, far above his contemporaries and even many of the most enlightened men of subsequent ages. If proof were needed for the high appreciation in which he was held in antiquity, it might be found in the circumstance that even the Greeks and Romans, not particu-

larly given to overrating foreign learning and wisdom, held him in the very highest estimation, as may be seen by their reiterated praises of the wisdom of him whose name they scarcely knew how to pronounce.

With regard, then, to the first point, his monotheism, it suffices to mention that while the fire-priests before him, the Soshyantôs, worshiped a plurality of good spirits called Ahuras, as opposed to the Indian devas, he reduced this plurality to a unity. This one supreme being he called Ahurô Mazdaô (that Ahura which is Mazdao), or the creator of the universe—the Auramazda of the cuneiform inscriptions of the Achemenidian kings, the Ahurmazd of Sassanian times, and the Hormazd or Ormazd of modern Parsees. This supreme god is by Zoroaster conceived to be "the creator of the earthly and spiritual life, the lord of the whole universe, at whose hands are all the creatures. The following extract from the Gâtha (Ustavaiti) will leave no doubt on that much-contested point: "Blessed is he, blessed are all men to whom the living wise God of his own command should grant those two everlasting powers (viz., immortality and wholesomeness). . . . I believe thee, O God, to be the best thing of all, the source of light for the world. Everybody shall choose thee as the source of light, thee, thee, holiest spirit Mazda! Thou greatest all good things by means of the power of thy good mind at any time, and promisest us, who believe in thee, a long life. I believe thee to be the powerful holy god Mazda! for thou givest with thy hand, filled with helps, good to the pious man, as well as to the impious, by means of the warmth of the fire strengthening the good things. From this reason, the vigor of the good mind has fallen to my lot. . . . Who was in the beginning the father and the creator of truth? Who showed to the sun and the stars their way? Who causes the moon to increase and wane, if not thou? . . . Who is holding the earth and the skies above it? Who made the waters and the trees of the field? Who is in the winds and in the storms, that they so quickly run? Who is the creator of the good-minded beings, thou wise? Who made the lights of good effect and the darkness? Who made the sleep of good effect and the activity? Who made morning, noon, and night?" Ahuramazda is thus to Zoroaster the light and the source of light. He is wisdom and intellect; he possesses all good things, temporal and spiritual, among them the good mind, immortality, wholesomeness, the best truth, devotion, piety, and abundance of all earthly good. All these gifts he grants to the pious man who is pure in thought, word, and deed. He rewards the good and punishes the wicked, and all that is created, good or evil, fortune or misfortune, is his work alone.

We spoke of Zoroaster's philosophical dualism, and of its having often been confounded with theological dualism, which it is certainly very far from being. Nothing was further from Zoroaster's mind than to assume anything but one supreme being, one and indivisible. But that everlasting problem of all thinking minds—viz., the origin of evil, and its incompatibility with God's goodness, holiness, and justice—he attempted to solve by assuming two primeval causes, which, though different, were united, and produced the world of the material things as well as that of the spirit. The one who produced the *reality* (gaya) is called Vohu Mano, the good mind; the other, through whom the non-reality (ajyâiti) originated, is the Akem Manô, the naught mind. To the first belong all good, true, and perfect things; to the second, all that is delusive, bad, wicked. These two aboriginal moving causes of the universe are called twins. They are spread everywhere, in God as in men. When united in Ahuramazda, they are called Cpentô Mainyus and Angrô Mainyus—i.e., white or holy; and dark spirit. It is only in later writings that these two are supposed to be opposed to each other, not within Ahuramazda, but without—to stand, in fact, in the relation of God and devil to each other. The inscriptions of Darius know but one god, without any adversary whatsoever. But while the one side with him produced all that was bright and shining, all that is good and useful in nature, the other side produced all that is dark and apparently noxious. Both are as inseparable as day and night, and, though opposed to each other, are indispensable for the preservation of creation. The bright spirit appears in the blazing flame, the presence of the dark is marked by the wood converted into charcoal. The one has created the light of the day, the other the darkness of night; the former awakens men to their duty, the other lulls them to sleep. Life is produced by the one, and extinguished by the other, who also, by releasing the soul from the fetters of the body, enables her to go up to immortality and everlasting life.

We have said already that the original monotheism of Zoroaster did not last long. False interpretations, misunderstandings, changes, and corruptions crept in, and dualism was established in theology. The two principles then for the first time became two powers, hostile to each other, each ruling over a realm of his own and constantly endeavoring to overthrow the other. This doctrine, which appears first fully developed in the Vendidad, once accepted by some of the most influential leaders, it soon followed that, like terrestrial rulers, each of the two powers must have a council and a court of his own. The number of councilors was six, each having to rule over some special province of creation; but Ahuramazda, who at first merely presided over this council, came gradually to be included in their number, and we then read of seven instead of the usual six Ameshaspentas, or immortal saints. These six supreme councilors, who have also found their way into the Jewish tradition embodied in the Talmud, are both by etymology and the sense of the passages in which they figure, distinctly seen to be but abstract nouns or ideas, representing the

gifts which God grants to all those who worship with a pure heart, who speak the truth, and perform good actions. The first of these angels or principles (Vohu Mano) is the vital faculty in all living beings of the good creation. He is the *son* of Ahuramazda, and penetrates the whole living good creation. By him are wrought all good deeds and words of men. The second (Ardibehesht) represents the blazing flame of fire, the light in luminaries, and brightness and splendor of any and every kind. He represents, as the light, the all-pervading, all-penetrating Ahuramazda's omnipresence. He is the preserver of the vitality of all life and all that is good. He thus represents providence. The third presides over metals, and is the giver of wealth. His name is Sharavar, which means possession, wealth. The fourth (Issandarmat = Devotion) represents the earth. It is a symbol of the pious and obedient heart of the true Ahuramazda worshiper, who serves God with his body and soul. The two last (Khordâd and Amerdât) preside over vegetation, and produce all kinds of fruit. But apart from the celestial council stands Sraosha (Serost) the archangel, vested with very high powers. He alone seems to have been considered a personality. He stands between God and man, the great teacher of the prophet himself. He shows the way to heaven, and pronounces judgment upon human action after death. He is, in the Yasna, styled the sincere, the beautiful, the victorious, who protects our territories, the true, the master of truth. "For his splendor and beauty, for his power and victory," he is to be worshiped and invoked. "He first sang the five Gâthas of Zarathustra Spitama;" that is, he is the bearer and representative of the sacred tradition, including the sacrificial rites and the prayers. He is the protector of all creation, for "he slays the demon of destruction, who prevents the growth of nature, and murders its life. He never slumbers but is always awake. He guards with his drawn sword the whole world against the attacks of the demons, endowed with bodies after sunset. He has a palace of 1000 pillars, erected on the highest summit of the mountain Alborj. It has its own light from inside, and from outside it is decorated with stars. . . . . He walks teaching religion round about the world." In men who do not honor him by prayer, the bad mind becomes powerful, and impregnates them with sin and crime, and they shall become utterly distressed both in this life and in the life to come.

In the same manner as Ahuramazda, his counterpart, Angrômainyus, was in later times endowed with a council, imitated from the one just mentioned, and consisting of six devas, or devils, headed by Angrômainyus himself, who is then styled Devânam Devo = arch-devil. The first after him is called Ako Mano, or Naught Mind, the original "non-reality," or evil principle of Zoroaster. He produces all bad thoughts, makes man utter bad words, and commit sin. The second place is taken by the Indian god Indra; the third by Shiva or Shaurva; the fourth, by Naonhaitya—the collective name of the Indian Ashuras or Dioscuri; the fifth and sixth, by the two personifications of "darkness" and "poison." There are many devas, or devils, besides to be found in the Zend-Avesta, mostly allegorical or symbolical names of evils of all kinds. While the heavenly council is always taking measures for promoting life, the infernal council is always endeavoring to destroy it. They endeavor to spread lies and falsehoods, and altogether coincide together with their great chief, with the devil and the infernal hierarchy of the New Testament.

Thus monotheism was in later times broken up and superseded by dualism. But a small party, represented by the Magi, remained steadfast to the old doctrine, as opposed to that of the followers of the false interpretation or Zend, the Zendiks. In order to prove their own interpretation of Zoroaster's doctrines, they had recourse to a false and ungrammatical explanation of the term Zervana Akarana, which, merely meaning time without bounds, was by them pressed into an identity with the Supreme Being; whilst the passages on which the present Destars, or Parsee priests, still rest their faulty interpretation, simply indicate that God created in the boundless time, i.e., that He is from eternity, self-existing, neither born nor created. Two intellects and two lives are further mentioned in the Zend-Avesta. By the former are to be understood the heavenly, spiritual wisdom, and the earthly wisdom, i.e., that which is learned by ordinary teaching and experience. The two lives are in the same manner distinguished as the bodily and the mental, i.e., body and soul. From these two lives, however, are to be distinguished the "first" and "last" lives, terms which refer to this life and the life to come. The belief in the latter, and in immortality, was one of the principal dogmas of Zoroaster, and it is held by many that it was not through Persian influence that it became a Jewish and a Christian dogma. Heaven is called the "house of hymns," a place where angels praise God incessantly in song. It is also called the "best life," or paradise. "Hell" is called the house of destruction. It is the abode chiefly of the priests of the bad (deva) religion. The modern Persians call the former Behesht; the latter, Duzak. Between heaven and hell there is the bridge of the gatherer or judge, over which the soul of the pious passes unharmed, while the wicked is precipitated from it into hell. The resurrection of the body is clearly and emphatically indicated in the Zend-Avesta; and it belongs, in all probability, to Zoroaster's original doctrine—not, as has been held by some, to later times, when it was imported into his religion by other religions. A detailed description of the resurrection and last judgment is contained in the Bundehesh. The same argument—the almightiness of the Creator—which is now employed to show the possibility of the elements, dissolved and scattered as they may be, being all brought

back again, and made once more to form the body to which they once belonged, is made use of there to prove the resurrection. There is still an important element to be noticed —viz., the Messiah, or Sosiosh, from whom the Jewish and Christian notions of a Messiah are held, by many, to have been derived. He is to awaken the dead bodies, to restore all life destroyed by death, and to hold the last judgment. Here, again, a later period introduced a plurality, notably a trinity. Three great prophets are also to appear when the end of the world draws nigh, respectively bearing the names of Moon of Happy Rule, Aurora of Happy Rule, and Sosiosh, who is supposed to be the son of Zarathustra, begotten in a supernatural way; and he will bring with him a new portion of Zend Avesta, hitherto hidden from man. Even a superficial glance at this sketch will show our readers what very close parallels between Jewish and Christian notions on the one hand, and the Zoroastrian on the other, are to be drawn; but, as we have noticed under Parsees (q.v.), an attentive reading of the Zend-Avesta reveals new and striking points of contact almost on every page.

We have in the foregoing sketch mainly followed Haug, the *facile princeps* of Zend studies in these days; but we have also taken into account the views of Windischmann, Spiegel, and other prominent investigators, and principally by quoting the words of the sacred sources themselves, when feasible, put our readers in a position to judge on the main points for themselves. We cannot, however, do better than thus briefly summarize, in conclusion, the principal doctrines of Zoroaster, as drawn from a certain speech (contained in the Gâthas), which, in all probability, emanates from Zoroaster himself.

"1. Everywhere in the world, a duality is to be perceived, such as the good and the evil, light and darkness; this life and that life, human wisdom and divine wisdom. 2. Only this life becomes a prey of death, but not that hereafter, over which the destructive spirit has no power. 3. In the universe, there are from the beginning two spirits at work, the one making life, the other destroying it. 4. Both these spirits are accompanied by intellectual powers, representing the ideas of the Platonic system on which the whole moral world rests. They cause the struggle between good and evil, and all the conflicts in the world, which end in the final victory of the good principle. 5. The principal duty of man in this life is to obey the word and commandments of God. 6. Disobedience is punished with the death of the sinner. 7. Ahuramazda created the idea of the good, but is not identical with it. This idea produced the good mind, the Divine Spirit, working in man and nature, and devotion—the obedient heart. 8. The Divine Spirit cannot be resisted. 9. Those who obey the word of God will be free from all defects, and immortal. 10. God exercises his rule in the world through the works prompted by the Divine Spirit, who is working in man and nature. 11. Men should pray to God and worship him. He hears the prayers of the good. 12. All men live solely through the bounty of God. 13. The soul of the pure will hereafter enjoy everlasting life; that of the wicked will have to undergo everlasting punishment—i.e., as modern Parsee theologians explain, to the day of the resurrection. 14. All creatures are Ahuramazda's. 15. He is the reality of the good mind, word, and deed." See Parsees, Guebers, Avesta, etc.

ZOSIMUS, of Constantinople, a Greek historian, who lived in the 5th c., A.D. He wrote the history of the Roman emperors, in six books, from Augustus to 410 A.D. His style is concise, clear, and interesting. He seeks to unfold the causes of the decline of the empire, and being himself a pagan, he adduces as the chief, the neglect of the pagan religion which attended the progress of Christianity. The unsparing severity with which he assails various Christian emperors, especially Constantine, has been considered by some (e.g., Bentley) to detract from his credibility as a historian. From his own point of view, he shows a considerable degree of acuteness in his remarks. Nothing is known of his personal history.

ZOSIMUS, Pope, and successor of Innocent I., requires a brief notice on account of his connection with the history of the heresiarch Pelagius (q.v.). Zosimus was a Greek by birth, and was elected bishop of Rome, Mar. 1, 417. The African bishops had condemned the opinions of Pelagius, and this judgment had been ratified by pope Innocent. In the interval, however, Pelagius appealed to the pope; and his disciple, Celestius, came in person to Rome, where he presented a confession of faith in his own justification. Zosimus, having convened a council of bishops and submitted this to them, was induced by the specious explanations of Celestius to suspend the judgment, and even to write to the African bishops, recommending a reconsideration of the case. This apparent conflict of Zosimus with his predecessor, although it has been used by the Gallican as well as Protestant controversialists as an argument against papal infallibility, was nevertheless only temporary. On further examination of Celestius, Zosimus became sensible that he had been deceived; and even before the reply of the African bishops, confirmed and renewed their original condemnation of the Pelagian doctrine. He died Dec. 26, 418. His letters, which are curious and interesting, are found in Constant's *Epistolæ Romanorum Pontificum.*

ZOUAVES (Arab. *Zwawa*), a body of troops in the French army, which derives its name from a tribe of Kabyles, inhabiting the mountains of Jurjura, in the Algerian province of Constantine. Long previous to the invasion of Algiers by the French, these Kabyles had been employed as hired mercenaries in the service of the rulers of Tripoli,

Tunis, and Algiers; and after the conquest of the last-named country in 1830, the French, in the hope of establishing a friendly feeling between the natives and their conquerors, took the late dey's mercenaries into their service, giving them a new organization. Accordingly gen. Clausel created, in 1830, two battalions of zouaves, in which each company consisted of French and Kabyles in certain proportions, officers, subalterns, and soldiers being selected from either race; the zouaves, though retaining their Moorish dress, were armed and disciplined after the European fashion; and the battalions were recruited by voluntary enlistment. As it was soon found, however, that the system of commingling the two races did not effect the object intended, the French and Kabyles were formed into separate companies; and in 1837 they were divided into three battalions, and put under the command of a colonel. Their first col. was Lamoricière, who mainly effected their reorganization, and under whom, as well as his successor, Cavaignac (q.v.), they distinguished themselves in many a bloody conflict with the Arabs of the south. Gradually, however, the native element was eliminated, and since 1840 they may be considered as French troops in a Moorish dress. In 1852 to 1855 their numbers were greatly augmented, and they now amount to upward of 10,000 men, divided into four regiments of four battalions each. They are recruited from the veterans of the ordinary infantry regiments who are distinguished for their fine "physique" and tried courage and hardihood; clad in a loose jacket and waistcoat of dark-blue cloth ornamented with yellow braid, loose madder-colored trousers, brown cloak, madder-colored Fez cap with a yellow tassel, surrounded by a green turban, a light-blue sash of wool, yellow leather leggings, and white gaiters; and armed with a carbine and sword-bayonet. The uniform of the officers and subalterns is the same as that of the hussars.

When the French and the African elements of the original zouave battalions were separated, the Africans were constituted into a separate body, under the name of Algerian tirailleurs, a force still recruited in Algiers to form a part (three regiments) of the regular French army. They are better known as *Turcos*.

ZSCHOKKE, Johann Heinrich Daniel, one of the most eminent German authors of this century, was b. at Magdeburg on Mar. 22, 1771. On leaving school at the age of 17, he joined a company of players in the capacity of a dramatic author. He traveled with them for some time, after which he entered the university of Frankfort. There he seems to have studied all subjects from divinity to administration (*Kameralwissenschaften*). He at the same time acted as a private teacher, and published plays which brought him some reputation, but no pay. In 1795 he was disappointed in obtaining the post of ordinary professor, for which he applied, and set out on a tour through Germany and France. He settled finally at Reichenau, in the Grisons, where he opened a boarding-school. So much pleased were the governing bodies of the canton with his establishment, that they presented him with the citizenship. In return for this favor, he wrote a history of the Grisons, published at Zürich in 1798 (*Geschichte des Freistaats der drei Bünde in Rhätien*). In the same year, however, Zschokke became unpopular in the canton by advocating its annexation to the Helvetic republic established by the French, and his school was in consequence closed. He removed to Aarau, then the seat of government, where he was employed as a commissioner to settle the affairs of Unterwalden, Uri, Schwyz, and Zug, a trust which he discharged with the utmost ability and good temper. The benevolent interest, indeed, which he manifested in the sufferings of the population has made his name memorable as a national benefactor. It would be tedious to enumerate the political and administrative affairs in which Zschokke was actively engaged after this period; we find him at one time protesting against the arbitrary proceedings of the French, and at another pointing out the prudence of concession, but always taking a course marked by practical sagacity and wisdom. In 1804 he was presented with the citizenship of Aargau and appointed inspector of woods and mines. In the same year he founded the Swiss messenger (*Schweizerboten*), a publication which rapidly became popular. It was followed by the Miscellany of the Latest News (*Miszellen für die neueste Weltkunde*), which was continued down to 1813. In 1811 he added a monthly periodical, the *Erheiterungen*, to these publications. He died at Aargau, June 27, 1848. Zschokke's works are very numerous, and are always characterized by sound information, good sense, and a vigorous and effective eloquence. The most important of his historical works, not mentioned above, are *History of the Forest Cantons*, a *History of Bavaria*, a *Popular History of Switzerland*. His novels or tales are more numerous and better known; among the best are *The Creole, Alamontade, Jonathan Frock, Clementine, Oswald*, and *Meister Jordan*. As a poet and play-writer, Zschokke has less merit. The most popular of all his writings was the *Stunden der Andacht* (tr. into English as *Meditations on Death and Eternity*, 1862); it supplied a complete exposition of modern rationalism, and yet displayed such zeal and eloquence in the cause of sound morality, that it met with approbation from persons of all creeds. It has gone through 40 German editions, and, with many other works of Zschokke, has been translated into English. There are many editions of his works (one of 40 vols., in 1854). See his *Life*, by Münich (1831), and by E. Zschokke (3d. ed., 1875).

ZSCHOPPAU, a t. of Saxony, in the circle of Zwickau, and about 36 m. s.w. of Dresden, on the river Zschoppau. It has a castle and two churches; manufactures of

hosiery, cloth, lace, etc.; weaving, wool-spinning, dyeworks, bleach-fields. Pop. '90, 7869.

ZUG, one of the smallest of the Swiss cantons, has an area of 92 sq. m. Pop. '70, 20,993; '94, 23,167. The south-eastern part of the canton borders on the Alpine region, and is hilly and pastoral; the north-western part, sloping to the plain of Switzerland, and inclosing a great part of the lake of Zug, is a rich and beautiful country of cornfields and orchards. The chief exports of Zug are dried fruit, cattle, and the products of the dairy. It is represented by one member in the national council. The inhabitants speak German, and are Roman Catholic. The battle of Morgarten, which founded the independence of Switzerland, was fought on the frontier of this canton in 1315; but it was not till 1352 that Zug joined the Swiss confederation. Capital, Zug.

ZUG, capital of the Swiss canton of the same name, and near the lake of Zug, 13 m. n.e. of Lucerne. The town has been much damaged by landslips. Pop. '88, 5160.

ZUIDER ZEE, a large gulf penetrating deep into the Netherlands, between 52° 26′ and 53° 20′ n. lat., is about 80 m. in length, and 210 m. in circumference. The islands Texel, Vlieland, Ter Schelling, Ameland, and Schiermonnikoog, reaching in a chain from the most northern point of Holland, are the remains of the former line of coast, which form a breakwater against the North sea. From Dunkirk in French Flanders to the n. of Holland, the interior is defended from the sea by sand-hills or downs. Here, as at the mouth of the Scheldt, the sand-barrier was broken, and the waters, overflowing the low lands, separated the province of Friesland from the peninsula of North Holland, and having united with the small inner lake Flevo, formed the present Zuider Zee. The decisive inundation occurred in 1282.

In the Zuider Zee lie the islands of Wieringen, Urk, Schokland, and Marken. Fishing is the principal industry. The light-tower on the e. point of Marken stands in 52° 27′ 37″ n. lat.; and the inhabitants are a hardy, industrious, and independent people, who live by fishing and exporting meadow-hay. They cling tenaciously to their old customs, and never marry except among themselves. The houses are built on artificial mounds, or "hills of refuge;" and the island being liable to frequent and heavy floods, few cows or sheep are kept, no gardens or trees planted, the necessaries of life being almost all brought from the main-land.

From the s.e. of the Zuider Zee, a long narrow arm, called the Y (pronounced *I*), formerly ran nearly due w. through the peninsula of Holland. A strong sea-dyke and locks have been constructed to cut off the Zuider Zee from the Y, through which a broad ship-canal has been made between Amsterdam and the North sea.

ZUKERTORT, J. H., b. Riga, Russia, 1862; of German parents. He was educated at Breslau; edited a chess-journal at Berlin, 1867–71; in 1872 went to reside in England. He was distinguished in chess-playing, especially as a blindfold player of many simultaneous games; and his writings on the game are of recognized value. At the international chess tournaments at Paris, 1878, and again at that in London, 1883, Z. won the first prize. He d. 1888.

ZULU, or AMAZULU, is the name of that portion of the Kaffir race who inhabit Natal and the region n.e. of it, until they gradually merge into the mere negro of the e. coast, n. of the Zambesi. The Kaffir organization appears to hold an intermediate place between that of the negro and a higher type; and as we go s. and w. from the swamps and malaria of Delagoa bay and Sofala to the more healthy and bracing regions of Natal and independent Kaffraria, the Kaffir features appear, as it were, to grow more refined —the mouth protrudes less, the lips are less thick, and the nose assimilates more to that of the European, although the distinguishing type of woolly hair may still continue.

The Zulu Kaffir is a far more amiable savage than his brother the Amakosa of the Cape frontier districts. He is less warlike and predatory, more industrious, and far more willing to act in the capacity of a farm-laborer or domestic servant. In language, customs, habits, etc., although certain tribal and local differences occur, yet they may be called common to all the nation, as a Zulu Kaffir has no difficulty in understanding a native of British Kaffraria; and his views of a future state, purchase of wives, etc., are pretty similar. The Zulu is by nature social, light of heart, and cheerful; his affections are gentle, steady, and enduring; his passions are, however, strong, and called out when in a state of war. He is comparatively chaste; crimes which stain European or eastern civilization are unknown to him. He is hospitable and honest, yet greedy and stingy; he is kind to his own family, yet cruel to dumb animals; and whatever the better nature of his impulses may be, yet when his great chief commands war, he is converted into a demon. He is proud, and very easily can distinguish between an English gentleman and the loafing tribe with which too many of our colonies are afflicted. The writer of this article, by the exercise of a little kindness and firmness, has experienced the most utter devotion from individuals of the Kaffir race generally. Their reasoning powers are good, and with an improved education a Zulu rationalist might not disgrace a chair in the Sorbonne.

It is from the Zulu country, however, that those terrible tyrants who so long devastated south-eastern Africa, the chiefs Chaka, Dingaan, Moselikatze, etc., issued. The training of their subjects to a peculiar mode of warfare spread desolation and havoc for

many years among the Betjuana and other tribes of the interior, until eventually these mighty chiefs with their thousands of followers, fighting, like Homer's heroes, hand to hand, armed with stabbing assagais and shields of ox-hide, the colors of which distinguished the different regiments they were formed into, melted away with broken power into comparative insignificance before the terrible rifles of a few hundred emigrant Dutch Boers, who, in their turn, gave way to the energetic action of the British authorities (see NATAL). The Zulus, although they have very often series intestine wars among themselves, have generally lived on friendly terms with the Natal colonists. That their warlike qualities have not decayed was sufficiently shown in the war that broke out in 1879 between England and Ketchwayo (Cetewayo), the Zulu king. Within a week or two after the British forces crossed the Natal frontier the Zulus inflicted a severe blow on the invaders by surrounding a camp at Isandhlwana and annihilating the defenders. They repulsed several attacks on their strongholds; but, after the British had received re-enforcements, were defeated at Ginghilovo, and completely broken by lord Chelmsford at Ulundi on July 3. The king was captured shortly afterward, and deported to Cape Town. The Zulu country was divided among 12 chiefs. But in 1883 Ketchwayo was reinstated in the central portion of his kingdom, with an English resident. The n. e. part was put under an independent chief, and on the s., adjoining the Natal border, another strip of territory was reserved for the chiefs unwilling to come again under Ketchwayo's authority (one of whom, John Dunn, is of English blood). Ketchwayo, vanquished by a rival, died a fugitive, 1884.

A number of missionary societies of the Wesleyan, Anglican, Norwegian, and Episcopal churches labor among these tribes. Considerable interest was some time ago provoked with regard to bishop Colenso's peculiar views for the evangelizing these heathens; and Colenso's Zulu was for a while almost as famous as Macaulay's New Zealander.

The Amafengu tribe, now settled along the Cape frontier, are a broken tribe of Zulus, driven far to the s.w. by Chaka or Dingaan, then reduced to slavery by the Amakosa Kaffers, and freed by sir B. Durban in the Kaffer war of 1834–35. The principal Zulu tribes are the Amazulu, the Amahute, Amazwazi, and Amatabele. The last emigrated far northward to the mountains which separate the basins of the Limpopo and Zambesi.

ZU'LULAND. The country lying n.e. of the colony of Natal, between its e. boundary, the Tugela and Umzimyati rivers, and Delagoa bay, is generally known under the name of Zululand, or the Zulu country, inhabited by tribes of Zulu Kaffirs. The great coast chain of mountains, which form in the Cape colony the Stormbergen, and further to the n.e. the Kahlamba and Drachenbergen, still continue well defined to the n.e., running parallel to the coast, but 120 m. distant from it, separating the coast region of Zululand from the higher plateaus of the Transvaal, and rising to an average height of 6,000 or 7,000 feet. East of the Tugela river, the country spreads out into large undulating, grassy plains, but sparsely wooded; while toward the foot of the mountains the kloofs afford some excellent timber. The principal rivers are the Umvoluzi or St. Lucia river, which enters the sea about 80 m. n.e. of the Natal frontier; and the Mapoota and its branches, which drain the n. part of the region, and fall into Delagoa bay. The country along the coast between the St. Lucia river and Delagoa bay is very flat, marshy, and unhealthy. A considerable range of mountains, called the Lebombo, run from the Umvoluzi river almost in a northerly direction to beyond Delagoa bay, about half way between the coast and the first range we have mentioned, forming a supporting buttress to a plateau of high level, similar to those so common in the Cape Colony and Natal. Z. was annexed by Great Britain, 1887.

This is generally a fertile region, and, as far as the coast-line, is healthy. Sugar, cotton, and other tropical products can be grown as advantageously as in the Natal colony, to which it forms, as it were, an intermediary link between the fever-regions of the e. coast and the more healthy climate of Natal and the Cape colony. The St. Lucia river marks the boundary line beyond which, to the n.e., Europeans cannot live. Up till the outbreak of the war in 1879, no good map of the Zulu country existed, and even yet, of course, we know very little of its geology or mineral productions. None of the rivers are available for inland navigation, although a large lagoon inside the mouth of the St. Lucia river can be ascended for a few miles. The rivers which flow into Delagoa bay from the n. are sluggish streams, often with no perceptible current, and can be ascended a considerable distance. A large quantity of ivory, rhinoceros' horns, hides, etc., are collected in this region by traders from Natal; and cattle, Indian corn, etc., thrive well in the country before the swampy region commences. The principal tribes are all of the Zulu race—the Amazulu inhabiting the region bordering on Natal; the Amahute, Amazwazi, etc., the country in the neighborhood of Delagoa bay. The Portuguese have a very decayed fort and settlement on Delagoa bay, garrisoned by a few mulatto soldiers, and carrying on some trade with the natives and Dutch Boers, in gunpowder, muskets, calico, etc., in exchange for ivory, horns, and other native produce; and a contraband one in slaves is also, we fear, winked at by the authorities, as captures are often made on the coast by British ships. The Dutch emigrant Boers, who very much required a port on the seaboard of s.e. Africa, would long since have seized

on Delagoa bay, if it were not from a wholesome dread of the very unhealthy climate, which appears to affect those stalwart sons of the highlands of s.e. Africa more even than it does Europeans or North Americans. See illus., AFRICA, vol. I.

ZULULAND - ZULUS, a region of s.e. Africa, along the Indian ocean; bounded, e. by the Indian ocean, s. by Natal, w. by Transvaal, extending n. to Delagoa bay. The part on the coast, about 120 m. in width, is marshy in the n. between St. Lucia river and Delagoa bay, but in the s. are good pasture plains. From the coast the land gradually rises to a mountain range about 6,000 ft. high. The soil is fertile, producing rice, cotton, sugar, and the usual tropical fruits. The northern part is unhealthy for foreigners. The people belong to the Kaffir race, and are in most respects far superior to the negroes. Generally mild and kind-hearted, they are in war very ferocious. The Portuguese have a small fort on Delagoa bay, garrisoned by mulattoes. At the bay there is a small export trade in horn, gold-dust, ivory, and gems, in return for cotton fabrics, gunpowder, and muskets. The American board has had a successful mission among the Zulus since 1836 in the region of Port Natal, though it was broken up by war in 1838. In 1879 the English waged a disastrous, costly, and unjust war with the Zulus. When the Transvaal was annexed to England, a district which had been overrun by the Dutch settlers passed under the jurisdiction of the British government. A special commission, to which the claims of Cetywayo, king of the Zulus, and the Boers were referred, decided that the land belonged to the Zulus, and should be surrendered to them immediately. The colonial authorities determined to disregard this decision, and to allow the squatters to remain in the disputed territory. This was the cause of the war. That the English desired to possess the territory of the Zulus is evident from the conditions of the ultimatum sent to Cetywayo. These were the surrender of certain chiefs, changes in marriage customs among the natives, the establishment of a British residency at the king's kraal, and the disbandment of the army. These conditions would have brought the country under British influence. Cetywayo was enraged when he received the proposals, and gave orders for an immediate advance of his army. Three columns of British troops from Natal invaded Cetywayo's territory. Severe battles took place, attended with great loss on both sides. At the battle of Ulundi the Zulus, 15,000 strong, were routed, Cetywayo fled, the army was broken up, and all the important chiefs submitted. See ZULU.

ZUMALA-CARREGUY, DON TOMAS, the most distinguished of the generals who supported the cause of Don Carlos during the Spanish civil war of 1833–40, was born in 1789 at Ormaiztegui, in the Biscayan province of Guipuzcoa. Of an aristocratic, though not wealthy family, he was deeply imbued from infancy with royalist sentiments, which gathered strength with increasing years, till they led him, like the Vendean leaders, to sacrifice fortune and life for a prince wholly unworthy of such devotion. At the time of the invasion of the peninsula by Napoleon, Zumala was a student of law at Pampeluna, and like many of the Spanish youth, he deserted his studies to take up arms against the invader, serving in Mina's corps till the close of the war. He afterward served under Quesada in the "army of the faith;" and on the re-establishment of absolutism, was raised to the rank of col., and appointed governor of Ferrol. He displayed excellent administrative qualities; but his decided leaning to the party of the Carlists (though he repelled indignantly all proposals to proclaim Don Carlos king during the life of Ferdinand VII.) becoming known, he was tried by a council of war, and acquitted. In 1832, when the army was purged of all officers suspected of Carlism, Zumala was dismissed, and retired to Pampeluna, where he lived in retirement till the death of Ferdinand and the rising of the Basque population called him to head the Carlist insurrection (Oct. 11, 1833). His motley army was without uniform, ill fed, and ill paid; yet the profound esteem in which "el Tio Tomas" was held by his followers enabled him to maintain an effective discipline. The overwhelming superiority in number of the Christinos, however, forced him to adopt a defensive system of tactics; so, holding the command of Biscay and Navarre, and the strongholds of Fuenterrabia and Irun, to assure his retreat into France, if necessary, he kept his opponents at bay, defeated Rodil in the valley of Amescoas (Aug. 1, 1834), routed another force of Christinos at Viana (Sept. 7), gained a second victory in the Amescoas valley in the following spring, completely defeating Valdez, after a battle of four days, and routed Iriarte near Guernica. These brilliant successes of his skillful and devoted partisan flattered the too sanguine and somewhat weak-minded Don Carlos with the hope of speedily seating himself on the throne, rendered him less willing than formerly to be guided by the counsels of Zumala, and led him to interfere with the latter's schemes, to his own detriment. Accordingly, after another year's successful fighting with the Christinos, Zumala was ordered to lay siege to Bilbao; but on June 15, 1835, he received a gun-shot wound so severe that he died ten days afterward. With Zumala's death, all hope of success for the Carlists was extinguished; and though the war dragged on desultorily for some years longer, the result was never doubtful. Zumala was as distinguished for generosity and disinterestedness as for fidelity; and so much had he impoverished himself by liberality to his soldiers, that neither his wardrobe nor his treasury supplied the means for his decent interment.—See Henningsen's *Twelve Months' Campaign with Zumala-Carreguy in Navarre and the Basque Provinces* (2 vols., Lond. 1836).

ZUMPT, Karl Gottlob, 1792–1849; educated at Heidelberg and Berlin. In 1838 he became prof. of Roman literature at the university of Berlin. His Latin grammar, which appeared in 1818 and was translated into English by Dr. L. Schmitz, was very successful. Among his works, besides editions of Cicero, Quintilian, and Quintus Curtius, are *Annales Veterum Regnorum et Populorum* (1819), and *Ueber dem Stand der Bevölkerung und die Volksvermehrung im Altertum* (1841).

ZUNI INDIANS, a tribe belonging to the Pueblos, a semi-civilized remnant of the Aztec empire; they inhabit a district of New Mexico about 200 miles s. e. of the Moquis settlements, and number about 2,000 souls. Their town (Zuni) is about half a sq. m. in area, and their houses, some of which are three and four stories high, are built of adobe. Ladders to the roof are used as a means of entrance. They have also smaller settlements in the district. The people are busied principally in agriculture, care little for the chase, and are peaceful in disposition, hospitable and industrious, receiving but little aid from the federal government. The authorities are a governor and a high priest; the latter is the oracle of the tribe, and its temporal and spiritual ruler, whose orders are the laws which are simply carried into execution by the government. Their traditions say that their people came from the n. w. on their march southward; that all Pueblo Indians belong to a common race and are members of the Aztecs or Montezumas; that some of the forefathers remained behind during the nation's migration, but that the greater body ultimately formed the empire of Mexico. They have also traditions of a flood; of the founding of their present town; of their subjugation for a time by the Spaniards; of the arrival of the first American in New Mexico, and of the Mexican and Navajo war. Several of their chief men made a pilgrimage to the Atlantic ocean, 1882, to procure some of its water which they deem sacred. They visited several cities, and excited a great deal of interest; being guided by Mr. Frank H. Cushing of the Smithsonian Institute at Washington, who has been adopted into the tribe, and has dwelt with them some years, for the purpose of studying their manners and customs.

ZUNZ, Leopold, b. Detmold, Germany, 1794; educated at Berlin, and became a preacher in the German-Jewish synagogue, and for some years teacher in a Jewish school, moving in 1835 to Prague, and again in 1839 to Berlin, where he was director of the normal seminary. He was a scholar and historical critic of the highest rank. In 1845 the government made him a member of the commission for investigating the educational status of the Prussian Jews. He wrote many books and essays on Hebrew literature, language, and history. He d. 1886.

ZURBARAN, Francisco, 1598–1662; b. Spain; studied painting, and imitated the manner of Caravaggio. His works, besides those at court, are found in churches, monasteries, and cathedrals, especially in Madrid and Seville. His "St. Thomas of Aquinas received into Heaven," regarded as his best work, was executed in 1625.

ZÜRICH, a canton on the n.e. frontier of Switzerland, is drained by the Rhine and its tributaries. Area 666 sq. m.; pop. '94, 351,917. It is traversed by ridges of lofty hills, running n.w. and s.e., between which lie three valleys, forming almost its whole surface—those of the Toss, the Glatt, and the Limmat. The lake of Zürich penetrates Zürich for a distance of 26 m., and connects it with the cantons of Schwyz and St. Gall. Zürich has not a fertile soil, but it is carefully cultivated. A considerable quantity of corn is raised in the canton, though not enough to supply the wants of the population. Vineyards and orchards are numerous; but the pasture lands are of much greater importance, and cattle form the chief wealth of the agricultural population. Zürich was one of the earliest seats of the cotton manufacture in Europe, and the spinning and weaving of cotton are still prosecuted with great success. The silk manufactures are nearly as important; and, more recently, the progress made in the manufacture of railway locomotives and other machinery has been a cause of some alarm to English engineers. The mechanics of Zürich divide their attention between agriculture and manufacturing industry, and are among the most prosperous and best educated workingmen in Europe. The canton is represented in the National Council by 17 representatives.

ZÜRICH, the capital of the canton of the same name, is situated at the point where the Limmat issues from the lake of Zürich, and unites with its tributary, the Sihl. Its population, including suburbs, in '96 was 130,000. It is one of the most prosperous manufacturing and commercial towns of Switzerland; yet the narrow streets and lofty houses of its older quarters, on the high ground e. of the river, give it the quaint appearance of a mediæval city. There are many interesting old buildings—the most remarkable being the cathedral, erected in the 11th century. There are a university, gymnasium, botanical gardens, a library and museum. The town library is extensive; and numerous museums of natural history, etc., indicate the intelligence and cultivated tastes of the population.

ZUTPHEN, a fortified t. in the Netherlands, province of Gelderland, is beautifully situated on the right bank of the Yssel, where that river is joined by the Berkel, in a picturesque district of country, chiefly under cultivation, and variegated with abundance of wood. It is one of the oldest towns in the kingdom, but has many elegant modern buildings. There are tanneries, spinning and weaving factories and manufactures of oil, paper, soap and carpets. Pop. '90, 17,044.

At Rysselt, a village near Zutphen, is a reformatory, called the Netherlands Mettray, in which about 150 boys are educated, and taught farm-labor and various handicrafts. It was founded in 1851, and has done much good. Nearly one-half of the boys have been withdrawn by their parents. The others obtain situations through the directors. The largest number have taken to farm-labor and gardening, for which the reformatory specially prepares them. Many have become soldiers and sailors; others smiths, house-painters, shoemakers, tailors, bakers, bricklayers, house-servants, etc. The institution is maintained by annual contributions, legacies, and a small charge for each boy. The receipts are about $17,500 annually, of which, on an average, a half is from legacies and contributions. The expenditure is about the same.

ZVENIGOROD'KA, an old t. of Russia, government of Kiev, on the Tikritch, a tributary of the Bug, about 125 m. s. of the town of Kiev. Pop. about 12,000. There are some manufactures and a trade in cattle.

ZVOR'NIK, a t. of Bosnia, which the Austrians, now administrating Bosnia, occupied in 1878 only after severe fighting, is on the Drina, about 60 m. n.e. of Bosna-Serai. The town is strongly fortified, standing on the face of a steep hill, at the summit of which is a strong fortress commanding the valley of the Drina. It has several mosques, Greek and Roman Catholic churches, lead-mines, and a considerable trade in timber. Pop. '85, 3030.

ZWEI'BRÜCKEN. See Deux-Ponts.

ZWICKAU, a picturesque, irregularly built, ancient-looking t. of Saxony, in a pleasant valley on the left bank of the Mulde, 60 m. s.w. of Dresden. The river is crossed here by three bridges. The town is the capital of the circle of Zwickau, and is the seat of a district court, court of appeal, and other public offices. Of its churches the most noteworthy is that of St. Mary, the finest Gothic edifice in the Erzgebirge, dating from 1453, distinguished by its tall tower, from which an extensive view can be obained; it contains a very fine altar-piece, by the old German master Wohlgemuth, and other interesting works of art. There are also a splendid court-house and exchange; a cloth hall, a district infirmary; a gymnasium, with a library of 20,000 vols.; a burgher, Catholic, trade, and other schools; an old castle, which has been converted into a workhouse. The town is prosperous, and the population increasing. There are cloth manufactories, breweries, dye-works, chemical works, tanneries, oil and saw mills. The chief source of its wealth, however, and that of the neighboring villages are the rich beds of coal in the surrounding district. There are also large iron-works in the neighborhood. The town is connected by railway with Leipsic, Dresden, and other important places, and has a considerable transit trade. Pop. '80, 35,005 ; '90, 44,198.

ZWINGLI, Ulrich, one of the most important of the reformers, was b. Jan. 1, 1484, at Wildhaus, in the canton of St. Gall, Switzerland, and was one of eight sons of the amtmann of that place. He studied first at Bern, then at the university of Vienna, where he devoted himself to philosophy; and afterward at Basel, where, under Wyttenbach, he directed his attention to theology. He became pastor in 1506 in Glarus. At this time his studies were chiefly directed to the Latin classics and the church fathers; but having begun to learn Greek in 1513, he from that time devoted himself to the New Testament. He wrote out the epistles of Paul in the original language, and learned them by heart, which was of great service to him afterward in his disputations. In the capacity of army chaplain, he attended the campaigns in Lombardy of the inhabitants of Glarus for the pope against the French, in 1512, 1513, and 1515, for which service he received a pension from the pope till 1517. In 1516 the liberal-minded administrator, Geroldseck, invited him to be preacher in the convent of Maria-Einsiedeln, famous for its pilgrimages. Here Zwingli began to preach against many abuses prevailing in the church; he also called on the bishops of Sitten and Constance to bestir themselves for the improvement of the church under the guidance of the Word of God. So little was he then suspected, that the papal legate, Antonio Pulci, conferred on him, in 1518, the diploma of chaplain to the holy see. He was soon afterward called to Zürich; and he entered on his office as pastor in the great cathedral there, Jan. 1, 1519, with a discourse, in which he declared himself for the pure gospel unfettered by glosses. In this office, to which was joined in 1521 that of canon in the cathedral, he laid the foundation of his subsequent work as reformer. The same cause that had stirred Luther into activity gave the impulse to Zwingli. In 1518 Bernardin Samson, a Franciscan from Milan, came to Switzerland for the purpose of selling indulgences for the benefit of the papal court. Zwingli, who was still in Einsiedeln on Samson's first appearance, opposed him both there and afterward in Zürich with the whole force of his pulpit eloquence, and succeeded so well that Samson was not allowed to enter the town of Zürich. From this time Zwingli, although attacked by the monks and many of his brother canons, advanced with rapid steps in his reforming career; for the magistracy of Zürich supported his measures to such a degree that, as early as 1520, they issued an order throughout their jurisdiction that the Word of God should be taught without human additions. In 1522 the reformation was formally established in Zürich. At this time Zwingli wrote his first book against the fasts of the Roman church; he also began to study the Hebrew language. The offers of high promotion made to him by Adrian VI. could not

make him waver. In Jan., 1523, the government of Zürich invited all theologians disposed to enter the lists with Zwingli to a conference at Zürich, which was attended by 600 clergy and laity. Zwingli had arranged the articles of faith, to the number of 67, which were to be the subject of the conference, and defended them so ably against the attacks of the celebrated Joh. Faber, afterward bishop of Vienna, that the council of Zürich declared in favor of Zwingli's doctrines, and upheld him and his assistants in adhering to them. The second disputation, Oct., 1523, at which Zwingli, before more than 900 people, spoke against the worship of images and the mass, was the cause of the removal of all pictures and statues from the churches of the city of Zürich and its jurisdiction; and this was followed in 1524 by the abolition of the mass. In the same year Zwingli entered into the married state with Anna Rheinhard, aged 43, the widow of a nobleman of the name of Meyer von Knonow. In the following year he published his creed, *Von der Wahren und Falschen Religion* (Of the True and False Religion). He had thus, in a few years, placed the work of reformation in his native land on a solid footing. He now pressed zealously forward in the same course; while the magistracy of Zürich, who all along actively supported him, abolished the begging friars, brought matters relating to marriage before the secular courts, and instituted a better management of church property. On a great many points, Zwingli was at one with Luther and the other German reformers; only, in regard to liturgical matters, he carried out his reform more radically according to the Bible, and rejected the dogma of the presence of Christ in the Lord's-supper. In order to heal the breach that had, as early as 1524, broken out between the two parties of the new religion on the latter point, a meeting between the Saxon and Swiss reformers was brought about by Philip, landgrave of Hesse, at Marburg in 1529. The conference lasted for three days, but little progress was made toward unity of opinion. See SACRAMENTARIAN. In 1531 open war broke out between Zürich on the one side, and the Catholic cantons of Lucerne, Schwyz, Uri, Unterwalden, and Zug on the other; and Zwingli, by command of the council of Zürich, had to take the field with the banner of the canton, which had always been borne by a priest. On Oct. 11 came the conflict; and as their opponents were more than double in number, and also better led, the Zürichers were beaten, and Zwingli was among the fallen. His collected works were published in Zürich in 1545, in 4 vols.; a selection, in 2 vols., appeared in 1819–21, edited by Usteri and Vögelin.—See the lives by Rotermund (1818), Hottinger (1820), Christoffel (1857), and Mörikofer (1869).

Of all the reformers, there is none more fitted to excite our love and respect than Zwingli. Fearlessly honest in purpose; with a clear head and eye for the truth; less violent, if less eloquent than Luther; more candid and open-minded, if less systematic and penetrating in spiritual insight than Calvin; he stands before us quite as original, if not as prominent as these reformers. His work was not so great as theirs, his influence not so extended; but his character was quite as genuine, and his labor, in some respects, quite as enduring.

ZWIRNER, ERNST FRIEDRICH, 1802–61; b. Silesia; studied architecture at Breslau and Berlin. In 1833 he was made architect to the Cologne cathedral, supervised the restoration of the old building, and planned the new n. and s. portals and the transept. Many of the modern churches and palaces in the towns on the Rhine were designed by him.

ZWOLLE, the capital of the Netherlands province of Overyssel, is situated on the Zwarte Water, and by the canal called the Willemsvaart has connection with the Yssel. It is one of the finest towns in the kingdom, having many beautiful private and public buildings. Both within and without the gates are pleasant promenades and drives, shaded by large trees. The surrounding country consists of rich meadows and cultivated fields, adorned by pretty country-seats. Zwolle has three extensive suburbs—Diezenpoorten, Kamperpoorten, and Sassenpoorten. It is most favorably situated for commerce, having, by navigable waters and railways, communication with the provinces around the Zuider Zee, Hanover, England, and other maritime nations. The trade in farm-produce and stock is very great. Principal industries are ship-building, tanning leather, rope-spinning, beer-brewing, soap-boiling, weaving calicoes and stockings, book and plate printing, making salt, cooperage, and refining sugar. The most important buildings are the town-house, palace of justice, and great church. There are many excellent charitable institutions; and, besides those for the ordinary branches of education, a flourishing grammar-school, in which pope Adrian VI. was partly educated, and a school of design. Zwolle has a cabinet of natural history, a literary and a musical society. Here the poet Rhynvis Feith (1753–1824) was born, and Thomas à Kempis lived during 71 years. Pop. 1893, 28,310.

ZYGODAC'TYLA (Gr. yoke-footed), a name given by some naturalists to a section of *pachydermata*, distinguished by having two principal hoofs upon which the animals walk, so that the foot resembles that of the *ruminantia*. This section includes only one family, the *suidæ*.—The term ZYGODACTYLOUS BIRDS is often applied, in ornithology, to those birds which have the toes in pairs, two before and two behind, as most of the *scansores*, or climbers (q.v.).

ZYGOPHYLLA'CEÆ, a natural order of exogenous plants, allied to *rubiaceæ*, and containing about 100 known species, herbaceous plants, shrubs, and trees, chiefly natives of

sub-tropical countries. They have opposite, generally pinnated leaves, without stipules. The flowers are solitary, or two or three together; the calyx 4 to 5-parted; the petals alternate with the calycine segments, and clawed; the stamens twice as many as the petals, generally rising from the back of small hypogynous scales; the ovary simple, 2 to 5-celled, with two or more ovules in each cell. The fruit is capsular, rarely somewhat fleshy, with 4 or 5 angles or wings. The most important genus is *guaiacum* (q.v.). The abundance of species of *zygophyllum* and some other genera constitutes one of the most striking features of n. African and Arabian deserts. The flowers of *Z. fabago* are employed as a substitute for capers, under the name of *bean-capers*. Those of *melianthus major*, a native of the cape of Good Hope, abound so much in honey that it is obtained from them for use by merely shaking the branches. The Turks use the seeds of *peganum harmala* both as a spice and for dyeing red.

ZYMOMETER: an instrument for testing the value of a sample of yeast, and for examining the progress of fermentation. It is founded on the production of carbonic acid in a given time, which is the consequence of the reduction of maltose. The speed of the fermentation is inversely as the square of the weight of the yeast.

ZYMOTIC DISEASES have been already referred to, and the most important of them are mentioned in the article Nosology. The class of diseases to which Dr. Farr has assigned this now generally accepted term comprises those which are *epidemic*, *endemic*, and *contagious*, as, for example, *fever*, *small-pox*, *plague*, *influenza*, *cholera*, *hooping-cough*, etc. As Dr. Farr observes: "The diseases of this class distinguish one country from another, or one year from another; they have formed epochs in chronology; and as Niebuhr has shown, have influenced not only the fate of cities, such as Athens and Florence, but of empires; they decimate armies and disable fleets; they take the lives of criminals that justice has not condemned; they redouble the dangers of crowded hospitals; they infest the habitations of the poor, and strike the artisan in his strength down from comfort into helpless poverty; they carry away the infant from the mother's breast, and the old man at the end of life; but their direst eruptions are excessively fatal to men in the prime and vigor of age. They are emphatically called the *morbi populares*." It must not be assumed, as the origin of the word (*zymē*, the Gr. for a ferment) might lead the reader to infer, that all the so-called zymotic diseases are true fermentations, for the class is intended to comprehend all the principal diseases which have prevailed as *epidemics* or *endemics*, and all those which are *communicable either by human contact or by animals in a state of disease*, as well as the diseases that result from the *scarcity and the deterioration of the necessary kinds of food*, or from *parasitic animals*. The diseases of this class thus arrange themselves into the four orders of *miasmatic*, *enthetic*, *dietic*, and *parasitic* disorders, of which *fever*, *syphilis*, *scurvy*, and *worms* may be regarded as the types.

Dr. Carpenter, in a memoir on *The Predisposing Causes of Epidemics*, shows that the conditions which give rise to zymotic diseases may be referred to the three following categories: (1.) Conditions which tend to introduce into the system decomposing matter that has been generated in some external source, as, for example, putrescent food, water contaminated by sewage or other decomposing matters, and air charged with miasmatic emanations. (2.) Conditions which occasion an increased production of decomposing matter in the system itself. The best example of this class of conditions is afforded in the puerperal state (or childbed), in which the tissue of the womb is undergoing rapid disintegration, and the decomposing matters which would be harmless at other times, are now able to act upon the blood of the woman, so as to induce that most fatal of all the zymotic diseases, puerperal fever. (3.) Conditions which obstruct the elimination of the decomposing matter normally or excessively generated within the system, or abnormally introduced into it from without. For example, any obstacle to the elimination of urea or uric acid, carbonic acid, biliary matters, lactic acid, etc., gives rise to as true poisoning as if these substances had been injected into the blood-vessels. The most important of the laws by which zymotic poisons are governed are noticed in the article Virus. The word zymotic, now commonly used by medical writers as a term to express a class of diseases which are preventable by the removal of known causes, should not be regarded as meaning more than this, or as embracing any scientific group of diseases. It is employed to class together all the diseases characterized by the property, which they have in common, of suddenly attacking large numbers of people. These may be subdivided according to their causes, whether due to *malaria*—in which case the diseases are endemic; to *specific disease poisons*, which are communicable either by direct contact, or by the indirect channels of air, water, etc.; to *parasites*, or to *scarcity* or *inferior quality* of *food*. The diseases of the group, therefore, fall into the four orders of *Miasmatic*, *Enthetic*, *Parasitic*, and *Dietic* disorders. The causation of the two latter orders is easily grasped, and can in every case be traced. But in the two former it is not always so clear. According to the germ theory (q.v.) of infectious diseases, the origin *de novo* of a fever poison is as impossible as the production of a man or a dog without parents. Day by day we observe the discovery of one after another of the septic organisms causing disease, and it is but natural to conclude that within a short time all the specific causes of the diseases referred to

will have been traced. It is urged by those who oppose the germ theory that there must have been at some time a spontaneous origin of the poisons, and that there still may be. The argument, however, has no weight. The question of the origin of the first contagium is to pathology what the origin of species is to physiology. The pathologist who is investigating the causation of specific diseases is no more to be troubled with the former problem than the biologist who is studying the phases of embryonic development should be with the latter. It has long been known that infectious diseases differ greatly in infectiveness. Few of the highly infectious diseases have at any time been supposed to arise *de novo*, but some of the less infectious —such as, for instance, typhoid fever—are still in certain quarters said to be of spontaneous origin, and due to the decomposition of excrementitious matters. But those who hold such a view must show in what way the decomposing matter acts. Common septic bacteria, we know, cause diarrhea, but they do not cause typhoid fever. A case of this fever, let us suppose, occurs in a small community. To all appearance the conditions of the place are unchanged and the house affected does not differ from its neighbors. How is it to be explained according to the spontaneous origin theory? In such cases it seems to be forgotten by what subtle channels contagium may be carried; further, the fact is overlooked that the stage of incubation in such diseases is indefinite, and that a chance visitor may have left the poison behind, while apparently in good health. Every case of a specific fever can be traced, by patient search, to infection. The prevalence of certain infectious maladies, more especially of those fevers which are common in childhood, is, according to Dr. Wilson, "in great measure attributable to the culpable neglect arising from the popular belief—amounting almost to fatalism—that children must contract them at some time, and that there is therefore little use in endeavoring to take any protective steps where the disease is epidemic. The consequence is that the epidemic continues to spread as long as susceptible victims are to be found in the community, and dies out only for a time when almost all these have been attacked." And it has been stated by Mr. Simon, "that the deaths which occur in this country (England and Wales) are fully a third more numerous than they would be if our existing knowledge of the chief causes of disease were reasonably well applied throughout the country; that of deaths, which in this sense may be called preventable, the average yearly number in England and Wales is about 120,000; and that of the 120,000 cases of preventable suffering which thus in every year attain their final place in the death-register, each unit represents a larger or smaller group of other cases, in which preventable disease, not ending in death, though often of far-reaching ill effects on life, has been suffered. And while these vast quantities of needless animal suffering, if regarded merely as such, would be matter for indignant human protest, it further has to be remembered, as of legislative concern, that the physical strength of a people is an essential and main factor of national prosperity; that disease, so far as it affects the workers of the population, is in direct antagonism to industry; and that disease which affects the growing and reproductive parts of a population must also in part be regarded as tending to the deterioration of the race."

ZYPÆUS, or VAN DEN ZYPE, FRANCIS, 1578–1650; b. Malines, Flanders; jurist and canonist, and author of several legal works. His brother HENRY, 1577–1659, abbot of Saint André, also was an author.

END OF VOL. XV.

INTERNATIONAL CYCLOPÆDIA.

REVISED EDITION.

CENSUS TABLES.

POPULATION OF THE UNITED STATES BY STATES AND COUNTIES, AS SHOWN BY THE NATIONAL CENSUSES OF 1880 AND 1890.*

ALABAMA.

Counties.	Population. 1880.	1890.
Autauga	13,108	13,330
Baldwin	8,603	8,941
Barbour	33,979	34,898
Bibb	9,487	13,824
Blount	15,369	21,927
Bullock	29,066	27,063
Butler	19,649	21,641
Calhoun	19,591	33,835
Chambers	23,440	26,319
Cherokee	19,108	20,459
Chilton	10,793	14,549
Choctaw	15,731	17,526
Clarke	17,806	22,624
Clay	12,938	15,765
Cleburne	10,976	13,218
Coffee	8,119	12,170
Colbert	16,153	20,189
Conecuh	12,605	14,594
Coosa	15,113	15,906
Covington	5,639	7,536
Crenshaw	11,736	15,425
Cullman	6,355	13,439
Dale	12,677	17,225
Dallas	48,433	49,350
De Kalb	12,675	21,106
Elmore	17,502	21,732
Escambia	5,719	8,666
Etowah	15,398	21,926
Fayette	10,135	12,823
Franklin	9,155	10,681
Geneva	4,342	10,690
Greene	21,931	22,007
Hale	26,553	27,501
Henry	18,761	24,847
Jackson	25,114	28,026
Jefferson	23,272	88,501
Lamar	12,142	14,187
Lauderdale	21,035	23,739
Lawrence	21,392	20,725
Lee	27,262	28,694
Limestone	21,600	21,201
Lowndes	31,176	31,550
Macon	17,371	18,439
Madison	37,625	38,119
Marengo	30,890	33,095
Marion	9,364	11,347
Marshall	14,585	18,935
Mobile	48,653	51,587
Monroe	17,091	18,990
Montgomery	52,356	56,172
Morgan	16,428	24,089
Perry	30,741	29,332
Pickens	21,479	22,470
Pike	20,640	24,423
Randolph	16 575	17,219
Russell	24,837	24,095
Saint Clair	14,462	17,353
Shelby	17,236	20,886
Sumter	28,728	29,574
Talladega	23,360	29,346
Tallapoosa	23,401	25,460
Tuscaloosa	24,957	30,352
Walker	9,479	16,078
Washington	4,538	7,935
Wilcox	31,828	30,816
Winston	4,253	6,552
Total	1,262,505	1,513,017

White, 833,718; Colored, 679,299, including 759 Indians.

ARIZONA.

Counties.	Population. 1880.	1890.
Apache	5,283	4,281
Cochise	.....	6,938
Gila	....	2,021
Graham	.....	5,670
Maricopa	5,689	10,986
Mohave	1,190	1,444
Pima	17,006	12,673
Pinal	3,044	4,251
Yavapai	5,013	8,685
Yuma	3,215	2,671
Total	40,440	59,620

ARKANSAS.

Counties.	Population. 1880.	1890.
Arkansas	8,038	11,432
Ashley	10,156	13,295
Baxter	6,004	8,527
Benton	20,328	27,716
Boone	12,146	15,816
Bradley	6,385	7,972
Calhoun	5,671	7,267
Carroll	13,337	17,288
Chico	10,117	11,419
Clark	15,771	20,997
Clay	7,213	12,200
Cleburne	.....	7,884
Cleveland	8,370	11,362
Columbia	14,090	19,893
Conway	12,755	19,459
Craighead	7,037	12,025
Crawford	14,740	21,714
Crittenden	9,415	13,940
Cross	5,050	7,693
Dallas	6,505	9,296
Desha	8,973	10,324
Drew	12,231	17,352
Faulkner	12,786	18,342
Franklin	14,951	19,934
Fulton	6,720	10,984
Garland	9,023	15,328
Grant	6,185	7,786
Greene	7,480	12,908
Hempstead	19,015	22,796
Hot Spring	7,775	11,603
Howard	9,917	13,789
Independence	18,086	21,961
Izard	10,857	13,038
Jackson	10,877	15,179
Jefferson	22,386	40,881
Johnson	11,565	16,758
Lafayette	5,730	7,700
Lawrence	8,782	12,984
Lee	13,288	18,886
Lincoln	9,255	10,255
Little River	6,404	8,903
Logan	14,885	20,774
Lonoke	12,146	19,263
Madison	11,455	17,402
Marion	7,907	10,390
Miller	9,919	14,714
Mississippi	7,332	11,635
Monroe	9,574	15,336
Montgomery	5,729	7,923
Nevada	12,959	14,832
Newton	6,120	9,950
Ouachita	11,758	17,033
Perry	3,872	5,538
Phillips	21,262	25,341
Pike	6,345	8,537
Poinsett	2,192	4,272
Polk	5,857	9,283
Pope	14,322	19,458
Prairie	8,435	11,374
Pulaski	32,616	47,329
Randolph	11,724	14,485
Saline	8,953	11,311
Scott	9,174	12,635
Searcy	7,278	9,664
Sebastian	19,560	33,200
Sevier	6,192	10,072
Sharpe	9,047	10,418
Stone	5,089	7,043
St. Francis	8,389	13,543
Union	13,419	14,977
Van Buren	9,565	8,567
Washington	23,844	32,024
White	17,794	22,946
Woodruff	8,646	14,009
Yell	13,852	18,015
Total	802,525	1,128,179

White, 818,752; Colored, 309,427, incl. 218 Indians and 92 Chinese.

CALIFORNIA.

Counties.	Population. 1880.	1890.
Alameda	62,976	93,864
Alpine	539	667
Amador	11,384	10,320
Butte	18,721	17,939
Calaveras	9,094	8,882
Colusa	13,118	14,640
Contra Costa	12,525	13,515
Del Norte	2,584	2,592
El Dorado	10,683	9,232
Fresno	9,478	32,026
Humboldt	15,512	23,469
Inyo	2,928	3,544
Kern	5,601	9,808
Lake	6,596	7,101
Lassen	3,340	4,239
Los Angeles	33,381	101,454
Marin	11,324	13,072
Mariposa	4,339	3,787
Mendocino	12,800	17,612
Merced	5,656	8,085
Modoc	4,399	4,986
Mono	7,499	2,002
Monterey	11,302	18,637
Napa	13,235	16,411
Nevada	20,823	17,369
Orange	.....	13,589
Placer	14,232	15,101
Plumas	6,180	4,933
Sacramento	34,390	40,339
San Benito	5,584	6,412
S. Bernardino	7,786	25,497
San Diego	8,618	34,987
San Francisco	233,959	298,997
San Joaquin	24,349	28,629
S. Luis Obispo	9,142	16,072
San Mateo	8,669	10,087
Santa Barbara	9,513	15,754
Santa Clara	35,039	48,005
Santa Cruz	12,802	19,270
Shasta	9,492	12,133
Sierra	6,623	5,051
Siskiyou	8,610	12,163
Solano	18,475	20,946
Sonoma	25,926	32,721

* Counties left blank have usually been consolidated with other counties, or have been organized since the date of the former census.

CALIFORNIA—CONTINUED.

COUNTIES.	Population. 1880.	1890.
Stanislaus	8,751	10,040
Sutter	5,159	5,469
Tehama	9,301	9,916
Trinity	4,999	3,719
Tulare	11,281	24,574
Tuolumne	7,848	6,082
Ventura	5,073	10,071
Yolo	11,772	12,684
Yuba	11,284	9,636
Total	864,694	1,208,130

COLORADO.

Arapahoe	38,644	132,135
Archuleta	.....	826
Baca	.....	1,479
Bent	1,654	1,313
Boulder	9,723	14,082
Chaffee	6,512	6,612
Cheyenne	....	534
Clear Creek	7,823	7,184
Conejos	5,605	7,193
Costilla	2,879	3,491
Custer	8,080	2,970
Delta	.....	2,534
Dolores	.....	1,498
Douglas	2,486	3,006
Eagle	.....	3,725
Elbert	1,708	1,856
El Paso	7,949	21,239
Fremont	4,735	9,156
Garfield	.....	4,478
Gilpin	6,489	5,867
Grand	417	604
Gunnison	8,235	4,359
Hinsdale	1,487	862
Huerfano	4,124	6,882
Jefferson	6,804	8,450
Kiowa	.....	1,243
Kit Carson	.....	2,472
Lake	23,563	14,663
La Plata	1,110	5,509
Larimer	4,992	9,712
Las Animas	8,903	17,208
Lincoln	.....	689
Logan	.....	3,070
Mesa	.....	4,260
Montezuma	.....	1,529
Montrose	.....	3,980
Morgan	.....	1,601
Otero	....	4,192
Ouray	2,669	6,510
Park	3,970	3,548
Phillips	.....	2,642
Pitkin	.....	8,929
Prowers	.....	1,969
Pueblo	7,617	31,491
Rio Blanco	....	1,300
Rio Grande	1,944	3,451
Routt	140	2,369
Saguache	1,973	3,313
San Juan	1,087	1,572
San Miguel	.....	2,909
Sedgwick	....	1,293
Summit	5,459	1,906
Washington	....	2,301
Weld	5,646	11,736
Yuma	....	2,596
Total	194,327	412,198

CONNECTICUT.

Fairfield	112,042	150,081
Hartford	125,382	147,180
Litchfield	52,044	53,542
Middlesex	35,589	39,524
New Haven	156,523	209,058
New London	73,152	76,634
Tolland	24,112	25,081
Windham	43,857	45,158
Total	622,700	746,258

DELAWARE.

COUNTIES.	Population. 1880.	1890.
Kent	32,874	32,664
New Castle	77,716	97,182
Sussex	36,018	38,647
Total	146,608	168,493

White, 140,066; Colored, 28,427

DIST. OF COLUMBIA.

Georget'n City	12,578	14,046
Washingt'n C'y	147,293	188,932
Remainder of the District.	17,753	27,414
Total	177,624	230,392

White, 154,695; Colored, 75,606: Chinese, 91.

FLORIDA.

Alachua	16,462	22,934
Baker	2,303	3,333
Bradford	6,112	7,516
Brevard	1,478	3,401
Calhoun	1,580	1,681
Citrus	.....	2,394
Clay	2,838	5,154
Columbia	9,589	12,877
Dade	257	861
De Soto	.....	4,944
Duval	19,431	26,800
Escambia	12,156	20,188
Franklin	1,791	3,308
Gadsden	12,169	11,894
Hamilton	6,790	8,507
Hernando	4,248	2,476
Hillsboro	5,814	14,941
Holmes	2,170	4,336
Jackson	14,372	17,544
Jefferson	16,065	15,757
La Fayette	2,441	3,686
Lake	.....	8,034
Lee	.....	1,414
Leon	19,662	17,752
Levy	5,767	6,586
Liberty	1,362	1,452
Madison	14,798	14,316
Manatee	3,544	2,895
Marion	13,046	20,796
Monroe	10,940	18,786
Nassau	6,635	8,294
Orange	6,618	12,584
Osceola	....	3,133
Pasco	.....	4,249
Polk	3,181	7,905
Putnam	6,261	11,186
Santa Rosa	6,645	7,961
St. John	4,535	8,712
Sumter	4,686	5,363
Suwannee	7,161	10,524
Taylor	2,279	2,122
Volusia	3,294	8,467
Wakulla	2,723	3,117
Walton	4,201	4,816
Washington	4,089	6,426
Total	269,493	391,422

White, 224,949; Colored, 166,180; Chinese, 108; Indians, 171; Japanese, 14.

GEORGIA.

Appling	5,276	8 676
Baker	7,307	6,144
Baldwin	13,806	14,608
Banks	7,337	8,562
Bartow	18,690	20,616
Berrien	6,619	10,694
Bibb	27,147	42,370
Brooks	11,727	12,979

GEORGIA—CONTINUED.

COUNTIES.	Population. 1880.	1890.
Bryan	4,929	5,520
Bulloch	8,053	13,712
Burke	27,128	28,501
Butts	8,311	10,565
Calhoun	7,024	8,488
Camden	6,183	6,178
Campbell	9,970	9,115
Carroll	16,901	22,301
Catoosa	4,739	5,431
Charlton	2,154	3,835
Chatham	45,023	57,740
Chattahoochee	5,670	4,902
Chattooga	10,021	11,202
Cherokee	14 325	15,412
Clarke	11,702	15,186
Clay	6,650	7,817
Clayton	8,027	8,295
Clinch	4,138	6,652
Cobb	20,748	22,286
Coffee	5,070	10,483
Colquitt	2,527	4,794
Columbia	10,465	11,281
Coweta	21,109	22,354
Crawford	8,656	9,315
Dade	4,702	5,707
Dawson	5,837	5,612
Decatur	19,072	19,949
De Kalb	14,497	17,189
Dodge	5,358	11,452
Dooly	12,420	18,146
Dougherty	12,622	12,206
Douglas	6,934	7,794
Early	7,611	9,792
Echols	2,553	3,079
Effingham	5,979	5,599
Elbert	12,957	15,376
Emanuel	9,759	14,703
Fannin	7,245	8,724
Fayette	8,605	8,728
Floyd	24,418	28,391
Forsyth	10,559	11,155
Franklin	11,453	14,670
Fulton	49,137	84,655
Gilmer	8,386	9,074
Glascock	3,577	3,720
Glynn	6,497	13,420
Gordon	11,171	12,758
Greene	17,547	17,051
Gwinnett	19,531	19,899
Habersham	8,718	11,573
Hall	15,298	18,047
Hancock	16,989	17,149
Haralson	5,974	11,316
Harris	15,758	16,797
Hart	9 094	10,887
Heard	8,769	9,557
Henry	14,193	16,220
Houston	22,414	21,613
Irwin	2,696	6.316
Jackson	16,297	19,176
Jasper	11,851	13,879
Jefferson	15,671	17,213
Johnson	4,800	6,129
Jones	11,613	12,709
Laurens	10,053	13,747
Lee	10,577	9,074
Liberty	10,649	12,887
Lincoln	6,412	6,146
Lowndes	11,049	15,102
Lumpkin	6,526	6,867
McDuffie	9,449	8,789
McIntosh	6,241	6,470
Macon	11,675	13,183
Madison	7,978	11,024
Marion	8,598	7,728
Meriwether	17,651	20,740
Miller	3,720	4,275
Milton	6,261	6,208
Mitchell	9,392	10,906
Monroe	18,808	19,137
Montgomery	5,281	9,248
Morgan	14,032	16,041
Murray	8,269	8,461
Muscogee	19,322	27,761
Newton	12,628	14,310
Oconee	6,251	7,713

GEORGIA—CONTINUED.

Counties.	Population. 1880.	1890.
Oglethorpe	15,400	16,951
Paulding	10,887	11,948
Pickens	6,790	8,182
Pierce	4,538	6,379
Pike	15,849	16,300
Polk	11,952	14,945
Pulaski	14,058	16,559
Putnam	14,539	14,842
Quitman	4,392	4,471
Rabun	4,634	5,606
Randolph	13,341	15,267
Richmond	34,665	45,194
Rockdale	6,838	6,813
Schley	5,302	5,443
Screven	12,786	14,424
Spalding	12,585	13,117
Stewart	13,998	15,682
Sumter	18,239	22,107
Talbot	14,115	13,258
Taliaferro	7,034	7,291
Tatnall	6,988	10,253
Taylor	8,597	8,666
Telfair	4,828	5,477
Terrell	10,451	14,503
Thomas	20,597	26,154
Towns	3,261	4,064
Troup	20,565	20,723
Twiggs	8,918	8,195
Union	6,431	7,749
Upson	12,400	12,188
Walker	11,056	13,282
Walton	15,622	17,467
Ware	4,159	8,811
Warren	10,885	10,957
Washington	21,964	25,237
Wayne	5,980	7,485
Webster	5,237	5,695
White	5,341	6,151
Whitfield	11,900	12,916
Wilcox	3,109	7,980
Wilkes	15,985	18,081
Wilkinson	12,061	10,781
Worth	5,892	10,048
Total	1,542,180	1,837,353

White, 978,357; Colored, 858,820; Chinese, 108; Indians, 68.

IDAHO.

Ada	4,674	8,368
Alturas	1,693	2,629
Bear Lake	3,235	6,057
Bingham	.....	13,575
Boisé	3,214	3,342
Cassia	1,312	3,143
Custer	.....	2,176
Elmore	.....	1,870
Idaho	2,031	2,955
Kootenai	518	4,108
Latah	.....	9,173
Lemhi	2,230	1,915
Logan	.....	4,169
Nez Perces	3,965	2,847
Oneida	6,964	6,819
Owyhee	1,426	2,021
Shoshone	469	5,382
Washington	879	3,836
Total	32,610	84,385

ILLINOIS.

Adams	59,135	61,888
Alexander	14,808	16,563
Bond	14,866	14,550
Boone	11,508	12,203
Brown	13,041	11,951
Bureau	33,172	35,014
Calhoun	7,467	7,652
Carroll	16,976	18,320
Cass	14,493	15,963

ILLINOIS—CONTINUED.

Counties.	Population. 1880.	1890.
Champaign	40,863	42,159
Christian	28,227	30,531
Clark	21,894	21,899
Clay	16,192	16,772
Clinton	18,714	17,411
Coles	27,042	30,093
Cook	607,524	1,191,922
Crawford	16,197	17,283
Cumberland	13,759	15,443
De Kalb	26,768	27,066
De Witt	17,010	17,011
Douglas	15,853	17,669
Du Page	19,161	22,551
Edgar	25,499	26,787
Edwards	8,597	9,444
Effingham	18,920	19,358
Fayette	23,241	23,367
Ford	15,099	17,035
Franklin	16,129	17,138
Fulton	41,240	43,110
Gallatin	12,861	14,935
Greene	23,010	23,791
Grundy	16,732	21,024
Hamilton	16,712	17,800
Hancock	35,337	31,907
Hardin	6,024	7,234
Henderson	10,722	9,876
Henry	36,597	33,338
Iroquois	35,451	35,167
Jackson	22,505	27,809
Jasper	14,515	18,188
Jefferson	20,686	22,590
Jersey	15,542	14,810
Jo Daviess	27,528	25,101
Johnson	13,078	15,013
Kane	44,939	65,061
Kankakee	25,047	28,732
Kendall	13,083	12,106
Knox	38,344	38,752
Lake	21,296	24,235
La Salle	70,403	80,798
Lawrence	13,663	14,693
Lee	27,491	26,187
Livingston	38,450	38,455
Logan	25,037	25,489
McDonough	27,970	27,467
McHenry	24,908	26,114
McLean	60,100	63,036
Macon	30,665	38,083
Macoupin	37,692	40,380
Madison	50,126	51,535
Marion	23,686	24,341
Marshall	15,055	13,653
Mason	16,242	16,067
Massac	10,443	11,313
Menard	13,024	13,120
Mercer	19,502	18,545
Monroe	13,682	12,948
Montgomery	28,078	30,003
Morgan	31,514	32,636
Moultrie	13,699	14,481
Ogle	29,937	28,710
Peoria	55,355	70,378
Perry	16,007	17,529
Piatt	15,583	17,062
Pike	33,751	31,000
Pope	13,256	14,016
Pulaski	9,507	11,355
Putnam	5,554	4,730
Randolph	25,690	25,049
Richland	15,545	15,019
Rock Island	38,302	41,917
St. Clair	61,806	66,571
Saline	15,940	19,342
Sangamon	52,894	61,195
Schuyler	16,249	16,013
Scott	10,741	10,304
Shelby	30,270	31,191
Stark	11,207	9,982
Stephenson	31,963	31,338
Tazewell	29,666	29,556
Union	18,102	21,549
Vermillion	41,588	49,905
Wabash	9,945	11,866
Warren	22,933	21,281

ILLINOIS—CONTINUED.

Counties.	Population. 1880.	1890.
Washington	21,112	19,262
Wayne	21,291	23,806
White	23,087	25,005
Whiteside	30,885	30,854
Will	53,422	62,007
Williamson	19,324	22,226
Winnebago	30,505	39,938
Woodford	21,620	21,429
Total	3,077,871	3,826,351

INDIANA.

Adams	15,385	20,181
Allen	54,763	66,689
Bartholomew	22,777	23,867
Benton	11,108	11,903
Blackford	8,020	10,461
Boone	25,922	26,572
Brown	10,264	10,308
Carroll	18,345	20,021
Cass	27,611	31,152
Clark	28,610	30,259
Clay	25,854	30,536
Clinton	23,472	27,370
Crawford	12,356	13,941
Daviess	21,552	26,227
Dearborn	26,671	23,364
Decatur	19,779	19,277
De Kalb	20,225	24,307
Delaware	22,926	30,131
Dubois	15,992	20,253
Elkhart	33,454	39,261
Fayette	11,304	12,630
Floyd	24,590	29,458
Fountain	20,228	19,558
Franklin	20,092	18,366
Fulton	14,301	16,746
Gibson	22,742	24,920
Grant	23,618	31,493
Greene	22,996	24,379
Hamilton	24,801	26,123
Hancock	17,123	17,829
Harrison	21,326	20,786
Hendricks	22,981	21,498
Henry	24,016	23,879
Howard	19,584	26,186
Huntington	21,805	27,644
Jackson	23,050	24,139
Jasper	9,464	11,185
Jay	19,282	23,478
Jefferson	25,977	24,507
Jennings	16,453	14,608
Johnson	19,537	19,561
Knox	26,324	28,044
Kosciusko	26,494	28,645
La Grange	15,630	15,615
Lake	15,091	23,886
La Porte	30,985	34,445
Lawrence	18,543	19,792
Madison	27,527	36,487
Marion	102,782	141,156
Marshall	23,414	23,818
Martin	13,475	13,973
Miami	24,683	25,823
Monroe	15,875	17,673
Montgomery	27,316	28,025
Morgan	18,900	18,643
Newton	8,167	8,803
Noble	22,956	23,359
Ohio	5,563	4,955
Orange	14,363	14,678
Owen	15,901	15,040
Parke	19,460	20,296
Perry	16,997	18,240
Pike	16,383	18,544
Porter	17,227	18,052
Posey	20,857	21,529
Pulaski	9,851	11,233
Putnam	22,501	22,335
Randolph	26,435	28,085
Ripley	21,627	19,350
Rush	19,238	19,034
St. Joseph	33,178	42,457

INDIANA — CONTINUED.

COUNTIES.	Population. 1880.	1890.
Scott	8,343	7,833
Shelby	25,257	25,454
Spencer	22,122	22,060
Starke	5,105	7,339
Steuben	11,645	14,478
Sullivan	20,336	21,877
Switzerland	13,336	12,514
Tippecanoe	35,966	35,078
Tipton	14,407	18,157
Union	7,673	7,006
Vanderburg	42,193	59,809
Vermilion	12,025	13,154
Vigo	45,058	50,195
Wabash	25,241	27,126
Warren	11,497	10,955
Warwick	20,162	21,161
Washington	18,955	18,619
Wayne	38,613	37,628
Wells	18,442	21,514
White	13,795	15,671
Whitley	16,941	17,768
Total	1,978,301	2,192,404

IOWA.

Adair	11,667	14,534
Adams	11,888	12,292
Allamakee	19,791	17,907
Appanoose	16,636	18,961
Audubon	7,448	12,412
Benton	24,888	24,178
Blackhawk	23,913	24,219
Boone	20,838	23,772
Bremer	14,081	14,630
Buchanan	18,546	18,997
Buena Vista	7,537	13,548
Butler	14,293	15,463
Calhoun	5,595	13,107
Carroll	12,351	18,828
Cass	6,943	19,645
Cedar	18,936	18,253
Cerro Gordo	11,461	14,864
Cherokee	8,240	15,659
Chickasaw	14,534	15,019
Clarke	11,513	11,332
Clay	4,248	9,309
Clayton	28,829	26,733
Clinton	36,763	41,199
Crawford	12,413	18,894
Dallas	18,746	20,479
Davis	16,468	15,258
Decatur	15,336	15,643
Delaware	17,950	17,349
Des Moines	33,099	35,324
Dickinson	1,901	4,328
Dubuque	42,996	49,848
Emmet	1,550	4,274
Fayette	22,258	23,141
Floyd	14,677	15,424
Franklin	10,249	12,871
Fremont	17,652	16,842
Greene	12,727	15,797
Grundy	12,639	13,215
Guthrie	14,394	17,380
Hamilton	11,252	15,319
Hancock	3,453	7,621
Hardin	17,807	19,003
Harrison	16,649	21,356
Henry	20,986	18,895
Howard	10,837	11,182
Humboldt	5,341	9,836
Ida	4,382	10,705
Iowa	19,221	18,270
Jackson	23,771	22,771
Jasper	25,963	24,943
Jefferson	17,469	15,184
Johnson	25,420	23,082
Jones	21,052	20,233
Keokuk	21,258	23,862
Kossuth	6,178	13,120
Lee	34,859	37,715

IOWA — CONTINUED.

COUNTIES.	Population. 1880.	1890.
Linn	37,237	45,303
Louisa	13,142	11,873
Lucas	14,530	14,563
Lyon	1,968	8,680
Madison	17,224	15,977
Mahaska	25,202	28,805
Marion	25,111	23,058
Marshall	23,752	25,842
Mills	14,137	14,548
Mitchell	14,363	13,299
Monona	9,055	14,515
Monroe	13,719	13,666
Montgomery	15,895	15,848
Muscatine	23,170	24,504
O'Brien	4,155	13,060
Osceola	2,219	5,574
Page	19,667	21,341
Palo Alto	4,131	9,318
Plymouth	8,567	19,568
Pocahontas	3,713	9,553
Polk	42,395	65,410
Pottawattamie	39,850	47,430
Poweshiek	18,936	18,394
Ringgold	12,085	13,556
Sac	8,774	14,522
Scott	41,266	43,164
Shelby	12,696	17,611
Sioux	5,426	18,370
Story	16,906	18,127
Tama	21,585	21,651
Taylor	15,635	16,384
Union	14,980	16,900
Van Buren	17,043	16,253
Wapello	25,285	30,426
Warren	19,578	18,269
Washington	20,374	18,468
Wayne	16,127	15,670
Webster	15,951	21,582
Winnebago	4,917	7,325
Winneshiek	23,938	22,528
Woodbury	14,996	55,632
Worth	7,953	9,247
Wright	5,062	12,057
Total	1,624,615	1,911,896

KANSAS.

Allen	11,303	13,509
Anderson	9,057	14,203
Arapahoe	3	.....
Atchison	26,668	26,758
Barbour	2,661	7,973
Barton	10,318	13,172
Bourbon	19,591	28,575
Brown	12,817	20,319
Buffalo	191	.....
Butler	18,586	24,055
Chase	6,081	8,233
Chautauqua	11,072	12,297
Cherokee	21,905	27,770
Cheyenne	37	4,401
Clark	163	2,357
Clay	12,320	16,146
Cloud	15,343	19,295
Coffey	11,438	15,856
Comanche	372	2,549
Cowley	21,538	34,478
Crawford	16,851	30,286
Decatur	4,180	8,414
Dickinson	15,251	22,273
Doniphan	14,257	13,535
Douglas	21,700	23,961
Edwards	2,409	3,600
Elk	10,623	12,216
Ellis	6,179	7,942
Ellsworth	8,494	9,272
Finney	.....	3,350
Foote	411	.....
Ford	3,122	5,308
Franklin	16,797	20,279

KANSAS — CONTINUED.

COUNTIES.	Population. 1880.	1890.
Garfield	.....	881
Geary*	6,994	10,423
Gove	1,196	2,994
Graham	4,258	5,029
Grant	9	1,308
Gray	.....	2,415
Greeley	3	1,264
Greenwood	10,548	16,309
Hamilton	168	2,027
Harper	4,133	13,266
Harvey	11,451	17,601
Haskell	.....	1,077
Hodgeman	1,704	2,395
Jackson	10,718	14,626
Jefferson	15,563	16,620
Jewell	17,475	19,349
Johnson	16,853	17,385
Kansas	9	.....
Kearny	159	1,571
Kingman	3,713	11,823
Kiowa	.....	2,873
Labette	22,735	27,586
Lane	601	2,060
Leavenworth	32,355	38,485
Lincoln	8,582	9,709
Linn	15,298	17,215
Logan	.....	3,384
Lyon	17,326	23,196
Marion	12,453	20,539
Marshall	16,136	23,912
McPherson	17,143	21,614
Meade	296	2,542
Miami	17,802	19,614
Mitchell	14,911	15,037
Montgomery	18,213	23,104
Morris	9,265	11,381
Morton	9	724
Nemaha	12,462	19,249
Neosho	15,121	18,561
Ness	3,722	4,944
Norton	6,998	10,617
Osage	19,642	25,062
Osborne	12,517	12,083
Ottawa	10,307	12,581
Pawnee	5,396	5,204
Phillips	12,014	13,661
Pottawattamie	16,350	17,722
Pratt	1,890	8,118
Rawlins	1,623	6,756
Reno	12,826	27,079
Republic	14,913	19,002
Rice	9,292	14,451
Riley	10,430	13,183
Rooks	8,112	8,018
Rush	5,490	5,204
Russell	7,351	7,333
Saline	13,808	17,442
Scott	43	1,262
Sedgwick	18,753	43,626
Sequoyah	568	.....
Seward	5	1,503
Shawnee	29,093	49,172
Sheridan	1,567	3,733
Sherman	13	5,261
Smith	13,883	15,613
Stafford	4,755	8,520
Stanton	5	1,031
Stevens	12	1,418
Sumner	20,812	30,271
Thomas	161	5,538
Trego	2,535	2,535
Wabaunsee	8,756	11,720
Wallace	686	2,468
Washington	14,910	22,894
Wichita	14	1,827
Wilson	13,775	15,286
Woodson	6,535	9,021
Wyandotte	19,143	54,407
Total	996,096	1,427,096

*Formerly Davis county.

White, 1,376,553; Colored, 50,543; Indians, 736; Chinese, 93.

KENTUCKY.

Counties.	Population. 1880.	1890.
Adair	13,078	13,721
Allen	12,089	13,692
Anderson	9,361	10,610
Ballard	14,378	8,390
Barren	22,231	21,490
Bath	11,982	12,813
Bell	6,655	10,312
Boone	11,996	12,246
Bourbon	15,956	16,976
Boyd	12,165	14,033
Boyle	11,930	12,948
Bracken	13,509	12,369
Breathitt	7,742	8,705
Breckenridge	17,486	18,976
Bullitt	8,521	8,291
Butler	12,181	13,956
Caldwell	11,282	13,186
Calloway	13,295	14,675
Campbell	37,440	44,208
Carlisle	.....	7,612
Carroll	8,953	9,266
Carter	12,345	17,204
Casey	10,983	11,848
Christian	31,682	34,118
Clark	12,115	15,434
Clay	10,222	12,447
Clinton	7,212	7,047
Crittenden	11,688	13,119
Cumberland	8,894	8,452
Daviess	27,730	33,120
Edmondson	7,222	8,005
Elliott	6,567	9,214
Estill	9,860	10,836
Fayette	29,023	35,698
Fleming	15,221	16,078
Floyd	10,176	11,256
Franklin	18,699	21,267
Fulton	7,977	10,005
Gallatin	4,832	4,611
Garrard	11,704	11,138
Grant	13,083	12,671
Graves	24,138	28,534
Grayson	15,784	18,688
Green	11,871	11,463
Greenup	13,371	11,941
Hancock	8,563	9,214
Hardin	22,564	21,304
Harlan	5,278	6,197
Harrison	16,504	16,914
Hart	17,133	16,439
Henderson	24,515	29,536
Henry	14,492	14,164
Hickman	10,651	11,637
Hopkins	19,122	23,505
Jackson	6,678	8,261
Jefferson	146,010	188,598
Jessamine	10,864	11,248
Johnson	9,155	11,027
Kenton	43,983	54,164
Knott	.....	5,433
Knox	10,587	13,762
La Rue	9,793	9,433
Laurel	9,131	13,747
Lawrence	13,262	17,702
Lee	4,254	6,205
Leslie	3,740	3,864
Letcher	6,601	6,920
Lewis	13,154	14,803
Lincoln	15,080	15,962
Livingston	9,165	9,474
Logan	24,358	23,812
Lyon	6,768	7,628
Madison	22,052	24,348
Magoffin	6,944	9,196
Marion	14,693	15,648
Marshall	9,647	11,287
Martin	3,057	4,209
Mason	20,469	20,773
McCracken	16,262	21,051
McLean	9,293	9,887
Meade	10,323	9,484
Menifee	3,755	4,666
Mercer	14,142	15,034
Metcalfe	9,423	9,871
Monroe	10,741	10,989
Montgomery	10,566	12,367
Morgan	8,455	11,249
Muhlenberg	15,098	17,955
Nelson	16,609	16,417
Nicholas	11,869	10,764
Ohio	19,669	22,946
Oldham	7,667	6,754
Owen	17,401	17,676
Owsley	4,942	5,975
Pendleton	16,702	16,346
Perry	5,607	6,331
Pike	13,001	17,378
Powell	3,639	4,698
Pulaski	21,318	25,731
Robertson	5,814	4,684
Rock Castle	9,670	9,841
Rowan	4,420	6,129
Russell	7,591	8,136
Scott	14,965	16,546
Shelby	16,813	16,521
Simpson	10,641	10,878
Spencer	7,040	6,760
Taylor	9,259	9,353
Todd	15,994	16,814
Trigg	14,489	13,902
Trimble	7,171	7,140
Union	17,809	18,229
Warren	27,531	30,158
Washington	14,419	13,622
Wayne	12,512	12,852
Webster	14,246	17,196
Whitley	12,000	17,590
Wolfe	5,638	7,180
Woodford	11,800	12,386
Total	1,648,690	1,858,635

White, 1,590,462; Colored, 268,074; Chinese, 28; Indians, 71.

LOUISIANA.

Parishes.		
Acadia	.....	13,231
Ascension	16,895	19,545
Assumption	17,010	19,629
Avoyelles	16,747	25,112
Bienville	10,442	14,108
Bossier	16,042	20,330
Caddo	26,296	31,555
Calcasieu	12,484	20,176
Caldwell	5,767	5,814
Cameron	2,416	2,828
Catahoula	10,277	12,002
Claiborne	18,337	23,312
Concordia	14,914	14,871
De Soto	15,603	19,860
E. Baton Rouge	19,966	25,922
East Carroll	12,134	12,362
East Feliciana	15,132	17,903
Franklin	6,495	6,900
Grant	6,188	8,270
Iberia	16,676	20,997
Iberville	17,544	21,348
Jackson	5,328	7,453
Jefferson	12,166	13,221
Lafayette	13,235	15,966
Lafourche	19,113	22,095
Lincoln	11,075	14,753
Livingstone	5,258	5,769
Madison	13,906	14,135
Morehouse	14,206	16,786
Natchitoches	19,707	25,836
Orleans	216,090	242,039
Ouachita	14,685	17,985
Plaquemines	11,575	12,541
Pointe Coupée	17,785	19,613
Rapides	23,563	27,642
Red River	8,573	11,318
Richland	8,440	10,230
Sabine	7,344	9,390
St. Bernard	4,405	4,326
St. Charles	7,161	7,737
St. Helena	7,504	8,062
St. James	14,714	15,715
St. John the Baptist	9,686	11,359
St. Landry	40,004	40,250
St. Martin	12,663	14,884
St. Mary	19,891	22,416
St. Tammany	6,887	10,160
Tangipahoa	9,638	12,655
Tensas	17,815	16,647
Terrebonne	17,957	20,167
Union	13,526	17,304
Vermilion	8,728	14,234
Vernon	5,160	5,903
Washington	5,190	6,700
Webster	10,005	12,466
West Baton Rouge	7,667	8,363
West Carroll	2,776	3,748
West Feliciana	12,809	15,062
Winn	5,846	7,082
Total	939,946	1,118,587

White, 558,395; Colored, 559,193; Chinese, 333; Indians, 627; Japanese, 39.

MAINE.

Counties.		
Androscoggin	45,042	48,968
Aroostook	41,700	49,589
Cumberland	86,359	90,949
Franklin	18,180	17,053
Hancock	38,129	37,312
Kennebec	53,058	57,012
Knox	32,863	31,473
Lincoln	24,821	21,996
Oxford	32,627	30,586
Penobscot	70,476	72,865
Piscataquis	14,872	16,134
Sagadahoc	19,272	19,452
Somerset	32,333	32,627
Waldo	32,463	27,759
Washington	44,484	44,482
York	62,257	62,829
Total	648,936	661,086

MARYLAND.

Allegany	38,012	41,571
Anne Arundel	28,526	34,094
Baltimore City	332,313	434,439
Baltimore co	83,336	72,909
Calvert	10,538	9,860
Caroline	13,766	13,903
Carroll	30,992	32,376
Cecil	27,108	25,851
Charles	18,548	15,191
Dorchester	23,110	24,843
Frederick	50,482	49,512
Garrett	12,175	14,213
Harford	28,042	28,993
Howard	16,140	16,269
Kent	17,605	17,471
Montgomery	24,759	27,185
Prince George	26,451	26,680
Queen Anne	19,257	18,461
St. Mary	16,934	15,819
Somerset	21,668	24,155
Talbot	19,065	19,736
Washington	38,561	39,782
Wicomico	18,016	19,930
Worcester	19,539	19,747
Total	934,943	1,042,390

White, 826,493; Colored, 215,657; Chinese, 189; Indians, 44; Japanese, 7.

MASSACHUSETTS.

Counties.	Population. 1880.	1890.
Barnstable	31,897	29,172
Berkshire	69,032	81,108
Bristol	139,040	186,465
Dukes	4,300	4,369
Essex	244,535	299,995
Franklin	36,001	38,610
Hampden	104,142	135,713
Hampshire	47,232	51,859
Middlesex	317,830	431,167
Nantucket	3,727	3,268
Norfolk	96,507	118,950
Plymouth	74,018	92,700
Suffolk	387,927	484,780
Worcester	226,895	280,787
Total	1,783,085	2,238,943

MICHIGAN.

Alcona	3,107	5,409
Alger	.....	1,238
Allegan	37,815	38,961
Alpena	8,789	15,581
Antrim	5,237	10,413
Arenac	....	5,683
Baraga	1,804	3,036
Barry	25,317	23,783
Bay	38,081	56,412
Benzie	3,433	5,237
Berrien	36,785	41,285
Branch	27,941	26,791
Calhoun	38,452	43,501
Cass	22,009	20,953
Charlevoix	5,115	9,686
Cheboygan	6,524	11,986
Chippewa	5,248	12,019
Clare	4,187	7,558
Clinton	28,100	26,509
Crawford	1,159	2,962
Delta	6,812	15,330
Eaton	31,225	32,094
Emmett	6,639	8,756
Genesee	39,220	39,430
Gladwin	1,127	4,208
Gogebic	.....	13,166
Grand Travers	8,422	13,355
Gratiot	21,936	28,668
Hillsdale	32,723	30,660
Houghton	22,473	35,389
Huron	20,089	28,545
Ingham	33,676	37,666
Ionia	33,872	32,801
Iosco	6,873	15,224
Iron	.....	4,432
Isabella	12,159	18,784
Isle Royale	55	135
Jackson	42,031	45,031
Kalamazoo	34,342	39,273
Kalkaska	2,937	5,160
Kent	73,253	109,922
Keweenaw	4,270	2,894
Lake	3,233	6,505
Lapeer	30,138	29,213
Leelanaw	6,253	7,944
Lenawee	48,343	48,448
Livingston	22,251	20,858
Luce	.....	2,455
Mackinac	2,902	7,830
Macomb	31,627	31,813
Manistee	12,532	24,230
Manitou	1,334	860
Marquette	25,394	39,521
Mason	10,065	16,385
Mecosta	13,973	19,697
Menominee	11,987	33,639
Midland	6,893	10,657
Missaukee	1,553	5,048
Monroe	33,624	32,337
Montcalm	33,148	32,637
Montmorency	.....	1,487
Muskegon	26,586	40,013
Newaygo	14,688	20,476
Oakland	41,537	41,245

MICHIGAN — Continued.

Counties.	Population. 1880.	1890.
Oceana	11,699	15,698
Ogemaw	1,914	5,583
Ontonagon	2,565	3,756
Osceola	10,777	14,630
Oscoda	467	1,904
Otsego	1,974	4,272
Ottawa	33,126	35,358
Presque Isle	3,113	4,687
Roscommon	1,459	2,033
Saginaw	59,095	82,273
St Clair	46,197	52,105
St. Joseph	26,626	25,356
Sanilac	26,341	32,589
Schoolcraft	1,575	5,818
Schiawassee	27,059	30,952
Tuscola	25,738	32,508
Van Buren	30,807	30,541
Washtenaw	41,848	42,210
Wayne	166,444	257,114
Wexford	6,815	11,278
Total	1,636,937	2,093,889

MINNESOTA.

Aitkin	366	2,462
Anoka	7,108	9,884
Becker	5,218	9,401
Beltrami	10	312
Benton	3,012	6,284
Big Stone	3,688	5,722
Blue Earth	22,889	29,210
Brown	12,018	15,817
Carlton	1,230	5,272
Carver	14,140	16,532
Cass	486	1,247
Chippewa	5,408	8,555
Chisago	7,982	10,359
Clay	5,887	11,517
Cook	65	98
Cottonwood	5,533	7,412
Crow Wing	2,319	8,852
Dakota	17,391	20,240
Dodge	11,344	10,864
Douglas	9,130	14,606
Faribault	13,016	16,708
Fillmore	28,162	26,966
Freeborn	16,069	17,962
Goodhue	29,651	28,806
Grant	3,004	6,875
Hennepin	67,013	185,294
Houston	16,332	14,653
Hubbard	.....	1,412
Isanti	5,063	7,607
Itasca	124	743
Jackson	4,806	8,924
Kanabec	505	1,579
Kandiyohi	10,159	13,997
Kittson	905	5,387
Lac-qui-Parle	4,891	10,382
Lake	106	1,299
Lesueur	16,103	19,057
Lincoln	2,945	5,691
Lyon	6,257	9,501
Marshall	992	9,130
Martin	5,249	9,403
McLeod	12,342	17,026
Meeker	11,739	15,456
Mille Lacs	1,501	2,845
Morrison	5,875	13,325
Mower	16,799	18,019
Murray	3,604	6,692
Nicollet	12,333	13,382
Nobles	4,435	7,958
Norman	.....	10,618
Olmsted	21,543	19,806
Otter Tail	18,675	34,232
Pine	1,365	4,052
Pipestone	2,092	5,132
Polk	11,433	30,192
Pope	5,874	10,032
Ramsey	45,890	139,796
Redwood	5,375	9,386

MINNESOTA — Continued.

Counties.	Population. 1880.	1890.
Renville	10,791	17,099
Rice	22,481	23,968
Rock	3,669	6,817
Saint Louis	4,504	44,862
Scott	13,516	13,831
Sherburne	3,855	5,908
Sibley	10,637	15,199
Stearns	21,956	34,844
Steele	12,460	13,232
Stevens	3,911	5,251
Swift	7,473	10,161
Todd	6,133	12,930
Traverse	1,507	4,516
Wabasha	18,206	16,972
Wadena	2,080	4,053
Waseca	12,385	13,313
Washington	19,563	25,492
Watonwan	5,104	7,746
Wilkin	1,906	4,346
Winona	27,197	33,797
Wright	18,104	24,164
Yellow Medicine	5,884	9,854
Total	780,773	1,301,826

MISSISSIPPI.

Adams	22,649	26,031
Alcorn	14,272	13,115
Amite	14,004	18,198
Attala	19,988	22,213
Benton	11,023	10,585
Bolivar	18,652	29,980
Calhoun	13,492	14,688
Carroll	17,795	18,773
Chickasaw	17,905	19,891
Choctaw	9,036	10,847
Claiborne	16,768	14,516
Clark	15,021	15,826
Clay	17,367	18,607
Coahoma	13,568	18,342
Copiah	27,552	30,233
Covington	5,993	8,299
De Soto	22,924	24,183
Franklin	9,729	10,424
Greene	3,194	3,906
Grenada	12,071	14,974
Hancock	6,439	8,318
Harrison	7,895	12,481
Hinds	43,958	39,279
Holmes	27,164	30,970
Issaquena	10,004	12,318
Itawamba	10,663	11,708
Jackson	7,607	11,251
Jasper	12,126	14,785
Jefferson	17,314	18,947
Jones	3,828	8,333
Kemper	15,719	17,961
Lafayette	21,671	20,553
Lauderdale	21,501	29,661
Lawrence	9,420	12,318
Leake	13,146	14,803
Lee	20,470	20,040
Le Flore	10,246	16,869
Lincoln	13,547	17,912
Lowndes	28,244	27,047
Madison	25,866	27,321
Marion	6,901	9,532
Marshall	29,330	26,043
Monroe	28,553	30,730
Montgomery	13,348	14,459
Neshoba	8,741	11,146
Newton	13,436	16,625
Noxubee	29,874	27,338
Oktibbeha	15,978	17,694
Panola	28,352	26,977
Pearl River	.....	2,957
Perry	3,427	6,494
Pike	16,688	21,203
Pontotoc	13,858	14,940
Prentiss	12,158	13,679
Quitman	1,407	3,286

MISSISSIPPI — CONTINUED.

COUNTIES.	Population. 1880.	1890.
Rankin	16,752	17,922
Scott	10,845	11,740
Sharkey	6,306	8,382
Simpson	8,008	10,138
Smith	8,088	10,635
Sunflower	4,661	9,384
Tallahatchie	10,929	14,361
Tate	18,721	19,253
Tippah	12,867	12,951
Tishomingo	8,774	9,302
Tunica	8,461	12,158
Union	13,030	15,606
Warren	31,238	33,164
Washington	25,367	40,414
Wayne	8,741	9,817
Webster	.....	12,060
Wilkinson	17,815	17,592
Winston	10,087	12,089
Yalobusha	15,649	16,629
Yazoo	33,845	36,394
Total	1,131,597	1,289,600

White, 544,851; Colored, 742,566; Indians, 2,036; Chinese, 471.

MISSOURI.

Adair	15,190	17,417
Andrew	16,318	16,000
Atchison	14,556	15,533
Audrain	19,732	22,074
Barry	14,405	22,943
Barton	10,332	18,504
Bates	25,381	32,223
Benton	12,396	14,973
Bollinger	11,130	13,121
Boone	25,422	26,043
Buchanan	49,792	70,100
Butler	6,011	10,164
Caldwell	13,646	15,152
Callaway	23,670	25,131
Camden	7,266	10,040
Cape Girard'u	20,998	22,060
Carroll	23,274	25,742
Carter	2,168	4,659
Cass	22,431	23,301
Cedar	10,741	15,620
Chariton	25,224	26,254
Christian	9,628	14,017
Clark	15,031	15,126
Clay	15,572	19,856
Clinton	16,073	17,138
Cole	15,515	17,281
Cooper	21,596	22,707
Crawford	10,756	11,961
Dade	12,557	17,526
Dallas	9,263	12,647
Daviess	19,145	20,456
De Kalb	13,344	14,539
Dent	10,646	12,149
Douglas	7,753	14,111
Dunklin	9,604	15,085
Franklin	26,534	28,056
Gasconade	11,153	11,706
Gentry	17,176	19,018
Greene	28,801	48,616
Grundy	15,185	17,876
Harrison	20,304	21,033
Henry	23,906	28,235
Hickory	7,387	9,453
Holt	15,509	15,469
Howard	18,428	17,371
Howell	8,814	18,618
Iron	8,183	9,119
Jackson	82,325	160,510
Jasper	32,019	50,500
Jefferson	18,736	22,484
Johnson	28,172	28,132
Knox	13,047	13,501
Laclede	11,524	14,701
Lafayette	25,710	30,184
Lawrence	17,583	26,228
Lewis	15,925	15,935
Lincoln	17,426	18,346

MISSOURI — CONTINUED.

COUNTIES.	Population. 1880.	1890.
Linn	20,016	24,121
Livingston	20,196	20,668
Macon	26,222	30,575
Madison	8,876	9,268
Maries	7,304	8,600
Marion	24,837	26,233
McDonald	7,816	11,283
Mercer	14,673	14,581
Miller	9,805	14,162
Mississippi	9,270	10,134
Moniteau	14,346	15,630
Monroe	19,071	20,790
Montgomery	16,249	16,850
Morgan	10,132	12,311
New Madrid	7,694	9,317
Newton	18,947	22,108
Nodaway	29,544	30,914
Oregon	5,791	10,467
Osage	11,824	13,080
Ozark	5,618	9,795
Pemiscot	4,299	5,975
Perry	11,895	13,237
Pettis	27,271	31,151
Phelps	12,568	12,636
Pike	26,715	26,321
Platte	17,366	16,248
Polk	15,734	20,339
Pulaski	7,250	9,387
Putnam	13,555	15,365
Ralls	11,838	12,294
Randolph	22,751	24,893
Ray	20,190	24,215
Reynolds	5,722	6,803
Ripley	5,377	8,512
Saline	29,911	33,762
Schuyler	10,470	11,249
Scotland	12,508	12,674
Scott	8,587	11,228
Shannon	3,441	8,898
Shelby	14,024	15,642
St. Charles	23,065	22,977
St. Clair	14,125	16,747
St. François	13,821	17,347
Ste. Genevieve	10,390	9,883
St. Louis (city)	350,518	451,770
St. Louis	31,888	36,307
Stoddard	13,431	17,327
Stone	4,404	7,090
Sullivan	16,569	19,000
Taney	5,559	7,973
Texas	12,206	19,406
Vernon	19,369	31,505
Warren	10,806	9,913
Washington	12,896	13,153
Wayne	9,096	11,927
Webster	12,175	15,177
Worth	8,203	8,738
Wright	9,712	14,484
Total	2,168,380	2,679,184

White, 2,528,458; Colored, 150,190; Indians, 127; Chinese, 409.

MONTANA.

Beaver Head	2,712	4,655
Cascade	.....	8,755
Choteau	3,058	4,741
Custer	2,510	5,308
Dawson	180	2,056
Deer Lodge	8,876	15,155
Fergus	.....	3,514
Gallatin	3,643	6,246
Jefferson	2,464	6,026
Lewis & Clarke	6,521	19,145
Madison	3,915	4,692
Meagher	2,743	4,749
Missoula	2,537	14,427
Park	.....	6,881
Silver Bow	.....	23,744
Yellowstone	.....	2,065
Total	39,159	132,159

NEBRASKA.

COUNTIES.	Population. 1880.	1890.
Adams	10,235	24,303
Antelope	3,953	10,399
Arthur	.....	91
Banner	.....	2,435
Blaine	.....	1,146
Boone	4,170	8,683
Box Butte	.....	5,494
Boyd	.....	695
Brown	.....	4,359
Buffalo	7,531	22,162
Burt	6,937	11,069
Butler	9,194	15,454
Cass	16,683	24,080
Cedar	2,899	7,028
Chase	70	4,807
Cherry	.....	6,428
Cheyenne	1,558	5,693
Clay	11,294	16,310
Colfax	6,588	10,453
Cuming	5,569	12,265
Custer	2,211	21,677
Dakota	3,213	5,386
Dawes	.....	9,722
Dawson	2,909	10,129
Deuel	.....	2,893
Dixon	4,177	8,084
Dodge	11,263	19,260
Douglas	37,645	158,008
Dundy	37	4,012
Fillmore	10,204	16,022
Franklin	5,465	7,693
Frontier	934	8,497
Furnas	6,407	9,840
Gage	13,164	36,344
Garfield	.....	1,659
Gosper	1,673	4,816
Grant	.....	458
Greeley	1,461	4,869
Hall	8,572	16,513
Hamilton	8,267	14,096
Harlan	6,086	8,158
Hayes	119	3,953
Hitchcock	1,012	5,799
Holt	3,287	13,672
Hooker	.....	426
Howard	4,391	9,430
Jefferson	8,096	14,850
Johnson	7,595	10,333
Kearney	4,072	9,061
Keith	194	2,556
Keya Paha	.....	3,920
Kimball	.....	959
Knox	3,666	8,582
Lancaster	28,090	76,395
Lincoln	3,632	10,441
Logan	.....	1,378
Loup	.....	1,662
McPherson	.....	401
Madison	5,589	13,669
Merrick	5,341	8,758
Nance	1,212	5,773
Nemaha	10,451	12,930
Nuckolls	4,235	11,417
Otoe	15,727	25,403
Pawnee	6,920	10,340
Perkins	.....	4,364
Phelps	2,447	9,869
Pierce	1,202	4,864
Platte	9,511	15,437
Polk	6,846	10,817
Red Willow	3,044	8,837
Richardson	15,031	17,574
Rock	.....	3,083
Saline	14,491	20,097
Sarpy	4,481	6,875
Saunders	15,810	21,577
Scotts' Bluff	.....	1,888
Seward	11,147	16,140
Sheridan	.....	8,687
Sherman	2,061	6,399
Sioux	699	2,452
Stanton	1,813	4,619
Thayer	6,113	12,738
Thomas	.....	517
Thurston	109	3,176

NEBRASKA — Continued.

Counties.	Population. 1880.	1890.
Valley	2,324	7,092
Washington	8,631	11,869
Wayne	813	6,169
Webster	7,104	11,210
Wheeler	644	1,683
York	11,170	17,279
Unorganized territory	2,913	.....
Total	452,402	1,058,910

NEVADA.

Churchill	479	703
Douglas	1,581	1,551
Elko	5,716	4,794
Esmeralda	3,220	2,148
Eureka	7,086	3,275
Humboldt	3,480	3,434
Lander	3,624	2,266
Lincoln	2,637	2,466
Lyon	2,409	1,987
Nye	1,875	1,290
Ormsby	5,412	4,883
Roop	286	.....
Storey	16,115	8,806
Washoe	5,664	6,437
White Pine	2,682	1,721
Total	62,266	45,761

NEW HAMPSHIRE.

Belknap	17,948	20,321
Carroll	18,224	18,124
Cheshire	28,734	29,579
Coos	18,580	23,211
Grafton	38,788	37,217
Hillsboro	75,634	93,247
Merrimack	46,300	49,435
Rockingham	49,064	49,650
Strafford	35,558	38,442
Sullivan	18,161	17,304
Total	346,991	376,530

NEW JERSEY.

Atlantic	18,704	28,836
Bergen	36,786	47,226
Burlington	55,402	58,528
Camden	62,942	87,687
Cape May	9,765	11,268
Cumberland	37,687	45,438
Essex	189,929	256,098
Gloucester	25,886	28,649
Hudson	187,944	275,126
Hunterdon	38,570	35,355
Mercer	58,061	79,978
Middlesex	52,286	61,754
Monmouth	55,538	69,128
Morris	50,861	54,101
Ocean	14,455	15,974
Passaic	68,860	105,046
Salem	24,579	25,151
Somerset	27,162	28,311
Sussex	23,539	22,259
Union	55,571	72,467
Warren	36,589	36,553
Total	1,131,116	1,444,933

NEW MEXICO.

Bernalillo	17,225	20,913
Colfax	3,398	7,974
Doña Ana	7,612	9,191
Grant	4,539	9,657
Lincoln	2,513	7,081
Mora	9,751	10,618
Rio Arriba	11,023	11,534
San Juan	.....	1,890

NEW MEXICO — Continued.

Counties.	Population. 1880.	1890.
San Miguel	20,638	24,204
Santa Fé	10,867	13,562
Sierra	.....	3,630
Socorro	7,875	9,595
Taos	11,029	9,868
Valencia	13,095	13,876
Total	119,565	153,593

White, 142,719; Colored, 2,320; Indians, 8,554.

NEW YORK.

Albany	155,890	164,555
Allegany	41,810	43,240
Broome	49,483	62,973
Cattaraugus	55,806	60,866
Cayuga	65,081	65,302
Chatauqua	65,342	75,202
Chemung	43,065	48,265
Chenango	39,891	37,776
Clinton	50,897	46,437
Columbia	47,928	46,172
Cortland	25,825	28,657
Delaware	42,721	45,496
Dutchess	79,184	77,879
Erie	219,884	322,981
Essex	34,515	33,052
Franklin	32,390	38,110
Fulton	30,985	37,650
Genesee	32,806	33,265
Greene	32,695	31,598
Hamilton	3,933	4,762
Herkimer	42,669	45,608
Jefferson	66,103	68,806
Kings	599,495	838,547
Lewis	31,416	29,806
Livingston	39,562	37,801
Madison	44,112	42,892
Monroe	144,903	189,586
Montgomery	38,315	45,699
New York	1,206,299	1,515,301
Niagara	54,173	62,491
Oneida	115,475	122,922
Onondaga	117,893	146,247
Ontario	49,451	48,453
Orange	88,220	97,859
Orleans	30,128	30,803
Oswego	77,911	71,883
Otsego	51,397	50,861
Putnam	15,181	14,849
Queens	90,574	128,059
Rensselaer	115,328	125,511
Richmond	38,991	51,693
Rockland	27,690	35,162
Saratoga	55,156	57,663
Schenectady	23,538	29,797
Schoharie	32,910	29,164
Schuyler	18,842	16,711
Seneca	29,278	28,227
Steuben	77,586	81,473
St. Lawrence	85,997	85,048
Suffolk	53,888	62,491
Sullivan	32,491	31,031
Tioga	32,673	29,935
Tompkins	34,445	32,923
Ulster	85,838	87,062
Warren	25,179	27,866
Washington	47,871	45,690
Wayne	51,700	49,729
Westchester	108,988	146,772
Wyoming	30,907	31,193
Yates	21,087	21,001
Total	5,082,871	5,997,853

NORTH CAROLINA.

Alamance	14,613	18,271
Alexander	8,355	9,430
Alleghany	5,486	6,523
Anson	17,994	20,027
Ashe	14,437	15,628

N. CAROLINA — Continued.

Counties.	Population. 1880.	1890.
Beaufort	17,474	21,072
Bertie	16,399	19,176
Bladen	16,158	16,763
Brunswick	9,389	10,900
Buncombe	21,909	35,266
Burke	12,809	14,939
Cabarrus	14,964	18,142
Caldwell	10,291	12,298
Camden	6,274	5,667
Carteret	9,784	10,825
Caswell	17,825	16,028
Catawba	14,946	18,689
Chatham	23,453	25,413
Cherokee	8,182	9,976
Chowan	7,900	9,167
Clay	3,316	4,197
Cleveland	16,571	20,394
Columbus	14,439	17,856
Craven	19,729	20,533
Cumberland	23,836	27,321
Currituck	6,476	6,747
Dare	3,243	3,768
Davidson	20,333	21,702
Davie	11,096	11,621
Duplin	18,773	18,690
Durham	.....	18,041
Edgecombe	26,181	24,113
Forsyth	18,070	28,434
Franklin	20,829	21,090
Gaston	14,254	17,764
Gates	8,897	10,252
Graham	2,335	3,313
Granville	31,286	24,484
Greene	10,037	10,039
Guilford	23,585	28,052
Halifax	30,300	28,908
Harnett	10,862	13,700
Haywood	10,271	13,346
Henderson	10,281	12,589
Hertford	11,843	13,851
Hyde	7,765	8,903
Iredell	22,675	25,462
Jackson	7,343	9,512
Johnston	23,461	27,239
Jones	7,491	7,403
Lenoir	15,344	14,879
Lincoln	11,061	12,586
McDowell	9,836	10,939
Macon	8,064	10,102
Madison	12,810	17,805
Martin	13,140	15,221
Mecklenburg	34,175	42,673
Mitchell	9,435	12,807
Montgomery	9,374	11,239
Moore	16,821	20,479
Nash	17,731	20,707
New Hanover	21,376	24,026
Northampton	20,032	21,242
Onslow	9,829	10,303
Orange	23,698	14,948
Pamlico	6,323	7,146
Pasquotank	10,369	10,748
Pender	12,468	12,514
Perquimans	9,466	9,293
Person	13,719	15,151
Pitt	21,794	25,519
Polk	5,062	5,902
Randolph	20,836	25,195
Richmond	18,245	23,948
Robeson	23,880	31,483
Rockingham	21,744	25,363
Rowan	19,965	24,123
Rutherford	15,198	18,770
Sampson	22,894	25,096
Stanly	10,505	12,136
Stokes	15,353	17,199
Surry	15,302	19,281
Swain	3,784	6,577
Transylvania	5,340	5,881
Tyrrell	4,545	4,225
Union	18,056	21,259
Vance	.....	17,581
Wake	47,939	49,207
Warren	22,619	19,360
Washington	8,928	10,200

N. CAROLINA — Continued.

Counties.	Population. 1880.	1890.
Watauga	8,160	10,611
Wayne	24,951	26,100
Wilkes	19,181	22,675
Wilson	16,064	18,644
Yadkin	12,420	13,790
Yancey	7,694	9,490
Total	1,399,750	1,617,947

White, 1,055,382; Colored, 561,019; Indians, 1514; 32, Chinese.

NORTH DAKOTA.

Barnes	1,585	7,045
Benson	.....	2,460
Billings	1,323	170
Bottineau	.....	2,893
Bowman	.....	6
Buford	.....	803
Burleigh	3,246	4,247
Cass	8,998	19,613
Cavalier	.....	6,471
Church	.....	74
Dickey	.....	5,573
Dunn	.....	159
Eddy	.....	1,377
Emmons	38	1,971
Flannery	.....	72
Foster	37	1,210
Garfield	.....	33
Grand Forks	6,248	18,357
Griggs	.....	2,817
Hettinger	.....	81
Howard	12	.....
Kidder	89	1,211
La Moure	20	3,187
Logan	.....	597
McHenry	.....	1,584
McIntosh	.....	3,248
McKenzie	.....	3
McLean	.....	860
Mercer	.....	428
Morton	200	4,728
Mountraille	13	122
Nelson	.....	4,293
Oliver	.....	404
Pembina	4,862	14,334
Pierce	.....	905
Ramsey	281	4,418
Ransom	537	5,393
Renville	.....	99
Richland	3,597	10,751
Rolette	.....	2,427
Sargent	.....	5,076
Sheridan	.....	5
Stark	.....	2,304
Steele	.....	3,777
Stevens	247	16
Stutsman	1,007	5,266
Towner	.....	1,450
Traill	4,123	10,217
Wallace	.....	24
Wallette	432	.....
Walsh	.....	16,587
Ward	.....	1,681
Wells	.....	1,212
Williams	14	109
Unorganized territory	.....	511
Total	36,909	182,719

OHIO.

Adams	24,005	26,093
Allen	31,314	40,644
Ashland	23,833	22,223
Ashtabula	37,139	43,655
Athens	28,411	35,194

OHIO — Continued.

Counties.	Population. 1880.	1890.
Auglaize	25,444	28,100
Belmont	49,638	57,413
Brown	32,911	29,899
Butler	42,579	48,597
Carroll	16,416	17,566
Champaign	27,817	26,980
Clark	41,948	52,277
Clermont	36,713	33,353
Clinton	24,756	24,240
Columbiana	48,602	59,029
Coshocton	26,642	26,703
Crawford	30,583	31,927
Cuyahoga	196,943	309,970
Darke	40,496	42,961
Defiance	22,515	25,769
Delaware	27,381	27,189
Erie	32,640	35,462
Fairfield	34,284	33,939
Fayette	20,364	22,309
Franklin	86,797	124,087
Fulton	21,053	22,023
Gallia	28,124	27,605
Geauga	14,251	13,489
Greene	31,349	29,820
Guernsey	27,197	28,645
Hamilton	313,374	374,573
Hancock	27,784	42,563
Hardin	27,023	28,939
Harrison	20,456	20,830
Henry	20,587	25,080
Highland	30,281	29,048
Hocking	21,126	22,658
Holmes	20,776	21,139
Huron	31,609	31,949
Jackson	23,686	28,408
Jefferson	33,018	39,415
Knox	27,431	27,600
Lake	16,326	18,235
Lawrence	39,068	39,356
Licking	40,450	43,279
Logan	26,267	27,386
Lorain	35,526	40,295
Lucas	67,377	102,296
Madison	20,129	20,057
Mahoning	42,871	55,079
Marion	20,565	24,727
Medina	21,453	21,742
Meigs	32,325	29,813
Mercer	21,808	27,220
Miami	36,158	39,754
Monroe	26,496	25,175
Montgomery	78,550	100,852
Morgan	20,074	19,143
Morrow	19,072	18,120
Muskingum	49,774	51,210
Noble	21,138	20,753
Ottawa	19,762	21,974
Paulding	13,485	25,932
Perry	28,218	31,151
Pickaway	27,415	26,959
Pike	17,927	17,482
Portage	27,500	27,868
Preble	24,533	23,421
Putnam	23,713	30,188
Richland	36,306	38,072
Ross	40,307	39,454
Sandusky	32,057	30,617
Scioto	33,511	35,377
Seneca	36,947	40,869
Shelby	24,137	24,707
Stark	64,031	84,170
Summit	43,788	54,089
Trumbull	44,880	42,373
Tuscarawas	40,198	46,618
Union	22,375	22,860
Van Wert	23,028	29,671
Vinton	17,223	16,045
Warren	28,392	25,468
Washington	43,244	42,380
Wayne	40,076	39,005
Williams	23,821	24,897
Wood	34,022	44,392
Wyandot	22,395	21,722
Total	3,198,062	3,672,316

OREGON.

Counties.	Population. 1880.	1890.
Baker	4,616	6,764
Benton	6,403	8,650
Clackamas	9,260	15,233
Clatsop	7,222	10,016
Columbia	2,042	5,191
Coos	4,834	8,874
Crook	.....	3,244
Curry	1,208	1,709
Douglas	9,596	11,864
Gillian	.....	3,600
Grant	4,303	5,080
Harney	.....	2,559
Jackson	8,154	11,455
Josephine	2,485	4,878
Klamath	.....	2,444
Lake	2,804	2,604
Lane	9,411	15,198
Linn	12,676	16,265
Malheur	.....	2,601
Marion	14,576	22,934
Morrow	.....	4,205
Multnomah	25,203	74,884
Polk	6,601	7,858
Sherman	.....	1,792
Tillamook	970	2,932
Umatilla	9,607	13,381
Union	6,650	12,044
Wallowa	.....	3,661
Wasco	11,120	9,183
Washington	7,082	11,972
Yamhill	7,945	10,692
Total	174,768	313,767

PENNSYLVANIA.

Adams	32,455	33,486
Allegheny	355,869	551,959
Armstrong	47,641	46,747
Beaver	39,695	50,077
Bedford	34,929	38,644
Berks	122,597	137,327
Blair	52,740	70,866
Bradford	58,541	59,233
Bucks	68,656	70,615
Butler	52,536	55,339
Cambria	46,811	66,375
Cameron	5,159	7,238
Carbon	31,923	38,624
Centre	37,922	43,269
Chester	83,481	89,377
Clarion	40,328	36,802
Clearfield	43,408	69,565
Clinton	26,278	28,085
Columbia	32,409	36,832
Crawford	68,607	65,324
Cumberland	45,977	47,271
Dauphin	76,148	96,977
Delaware	56,101	74,683
Elk	12,800	22,239
Erie	74,688	86,074
Fayette	58,842	80,606
Forest	4,385	8,482
Franklin	49,855	51,433
Fulton	10,149	10,137
Greene	28,273	28,935
Huntingdon	33,954	35,751
Indiana	40,527	42,175
Jefferson	27,935	44,005
Juniata	18,227	16,655
Lackawanna	89,269	142,088
Lancaster	139,447	149,095
Lawrence	33,312	37,517
Lebanon	38,476	48,131
Lehigh	65,969	76,631
Luzerne	133,065	201,203
Lycoming	57,486	70,579
McKean	42,565	46,863
Mercer	56,161	55,744
Mifflin	19,577	19,996
Munroe	20,175	20,111

PENNSYLVANIA—Cont'd.

Counties.	Population. 1880.	1890.
Montgomery	96,494	123,290
Montour	15,468	15,645
Northampton	70,312	84,220
North'berland	53,123	74,698
Perry	27,522	26,276
Philadelphia	847,170	1,046,964
Pike	9,663	9,412
Potter	13,797	22,778
Schuylkill	129,974	154,163
Snyder	17,797	17,651
Somerset	33,110	37,317
Sullivan	8,073	11,620
Susquehanna	40,354	40,093
Tioga	45,814	52,313
Union	16,905	17,820
Venango	43,670	46,640
Warren	27,981	37,585
Washington	55,418	71,155
Wayne	33,513	31,010
Westmoreland	77,036	112,819
Wyoming	15,598	15,891
York	87,841	99,489
Total	4,282,891	5,258,014

RHODE ISLAND.

Bristol	11,394	11,428
Kent	20,588	26,754
Newport	24,180	28,552
Providence	197,874	255,123
Washington	22,495	23,649
Total	276,531	345,506

SOUTH CAROLINA.

Abbeville	40,815	46,854
Aiken	28,112	31,822
Anderson	33,612	43,696
Barnwell	39,857	44,613
Beaufort	30,176	34,119
Berkeley	.....	55,428
Charleston	102,800	59,903
Chester	24,153	26,660
Chesterfield	16,345	18,468
Clarendon	19,190	23,233
Colleton	36,386	40,293
Darlington	34,485	29,134
Edgefield	45,844	49,259
Fairfield	27,765	28,599
Florence	.	25,027
Georgetown	19,613	20,857
Greenville	37,496	44,310
Hampton	18,741	20,544
Horry	15,574	19,256
Kershaw	21,538	22,361
Lancaster	16,903	20,761
Laurens	29,444	31,610
Lexington	18,564	22,181
Marion	34,107	29,976
Marlboro	20,598	23,500
Newberry	26,497	26,434
Oconee	16,256	18,687
Orangeburg	41,395	49,393
Pickens	14,389	16,389
Richland	28,573	36,821
Spartanburg	40,409	55,385
Sumter	37,037	43,605
Union	24,080	25,363
Williamsburg	24,110	27,777
York	30,713	38,831
Total	995,577	1,151,149

White, 462,008; Colored, 688,934; Indians, 173; Chinese, 34.

SOUTH DAKOTA.

Counties.	Population. 1880.	1890.
Aurora	69	5,045
Beadle	1,290	9,586
Bon Homme	5,468	9,057
Boreman	534	.....
Brookings	4,965	10,132
Brown	353	16,855
Brûlé	238	6,737
Buffalo	63	993
Butte	.....	1,037
Campbell	50	3,510
Charles Mix	407	4,178
Choteau	.....	8
Clark	114	6,728
Clay	5,001	7,509
Codington	2,156	7,037
Custer	995	4,891
Davison	1,256	5,449
Day	97	9,168
Delano	.....	40
Deuel	2,302	4,574
Dewey	46	.....
Douglas	6	4,600
Edmunds	.....	4,399
Ewing	.....	16
Fall River	.....	4,478
Faulk	4	4,062
Grant	3,010	6,814
Gregory	.....	295
Hamlin	693	4,625
Hand	153	6,546
Hanson	1,301	4,267
Harding	.....	167
Hughes	268	5,044
Hutchinson	5,573	10,469
Hyde	.....	1,860
Jackson	.....	30
Jerauld	.....	3,605
Kingsbury	1,102	8,562
Lake	2,657	7,508
Lawrence	13,248	11,673
Lincoln	5,896	9,143
Lugenbeel	.....	.....
Lyman	124	233
McCook	1,283	6,448
McPherson	.....	5,940
Marshall	.....	4,544
Martin	.....	7
Meade	..	4,640
Meyer	115	..
Miner	363	5,165
Minnehaha	8,251	21,879
Moody	3,915	5,941
Nowlin	.....	149
Pennington	2,244	6,540
Potter	.....	2,910
Pratt	.....	23
Presho	.....	181
Pyatt	.....	34
Rinehart	.....	.....
Roberts	.....	1,997
Sanborn	.....	4,610
Schnasse	.....	..
Scobey	.....	32
Shannon	113	.....
Spink	477	10,581
Stanley	793	1,028
Sterling	.....	96
Sully	296	2,412
Todd	203	188
Tripp	.	.....
Turner	5,320	10,256
Union	6,813	9,130
Wagner	.....	.....
Walworth	46	2,153
Washabaugh	.....	.....
Washington	.....	40
Yankton	8,390	10,444
Ziebach	.....	510
Fort Sisseton	134	.....
Sisseton and Wahpeton Indian reservation	73	.....
Total	98,268	328,808

TENNESSEE.

Counties.	Population. 1880.	1890.
Anderson	10,820	15,128
Bedford	26,025	24,739
Benton	9,780	11,230
Bledsoe	5,617	6,134
Blount	15,985	17,589
Bradley	12,124	13,607
Campbell	10,005	13,486
Cannon	11,859	12,197
Carroll	22,103	23,630
Carter	10,019	13,389
Cheatham	7,956	8,845
Chester	.....	9,069
Claiborne	13,373	15,103
Clay	6,987	7,260
Cocke	14,808	16,523
Coffee	12,894	13,827
Crockett	14,109	15,146
Cumberland	4,538	5,376
Davidson	79,026	108,174
Decatur	8,498	8,995
De Kalb	14,813	15,650
Dickson	12,460	13,645
Dyer	15,118	19,878
Fayette	31,871	28,878
Fentress	5,941	5,226
Franklin	17,178	18,929
Gibson	32,685	35,859
Giles	36,014	34,957
Granger	12,384	13,196
Greene	24,005	26,614
Grundy	4,592	6,345
Hamblen	10,187	11,418
Hamilton	23,642	53,482
Hancock	9,098	10,342
Hardeman	22,921	21,029
Hardin	14,793	17,698
Hawkins	20,610	22,246
Haywood	26,053	23,558
Henderson	17,430	16,336
Henry	22,142	21,070
Hickman	12,095	14,499
Houston	4,295	5,390
Humphreys	11,379	11,720
Jackson	12,008	13,325
James	5,187	4,903
Jefferson	15,846	16,478
Johnson	7,766	8,858
Knox	39,124	59,557
Lake	3,968	5,304
Lauderdale	14,918	18,756
Lawrence	10,383	12,286
Lewis	2,181	2,555
Lincoln	26,960	27,382
Loudon	9,148	9,273
McMinn	15,064	17,890
McNairy	17,271	15,510
Macon	9,321	10,878
Madison	30,874	30,497
Marion	10,910	15,411
Marshall	19,259	18,906
Maury	39,904	38,112
Meigs	7,117	6,930
Monroe	14,283	15,329
Montgomery	28,481	29,697
Moore	6,233	5,975
Morgan	5,156	7,639
Obion	22,912	27,273
Overton	12,153	12,039
Perry	7,174	7,785
Pickett	.....	4,736
Polk	7,269	8,361
Putnam	11,501	13,683
Rhea	7,073	12,647
Roane	15,237	17,418
Robertson	18,861	20,078
Rutherford	36,741	35,097
Scott	6,021	9,794
Sequatchie	2,565	3,027
Sevier	15,541	18,761
Shelby	78,430	112,740
Smith	17,799	18,404
Stewart	12,690	12,193
Sullivan	18,321	20,879
Sumner	23,625	23,668
Tipton	21,033	24,271

TENNESSEE — Continued.

Counties.	Population. 1880.	1890.
Trousdale	6,646	5,850
Unicoi	3,645	4,619
Union	10,260	11,459
Van Buren	2,933	2,863
Warren	14,079	14,413
Washington	16,181	20,354
Wayne	11,301	11,471
Weakley	24,538	28,955
White	11,176	12,348
Williamson	28,313	26,321
Wilson	28,747	27,148
Total	1,542,359	1,767,518

White, 1,336,637; Colored, 430,678; Chinese, 51; Indians, 146; Japanese, 6.

TEXAS.

Counties.	Population. 1880.	1890.
Anderson	17,395	20,923
Andrews	.....	24
Angelina	5,239	6,306
Aransas	996	1,824
Archer	596	2,101
Armstrong	31	944
Atascosa	4,217	6,459
Austin	14,429	17,859
Bailey	.....	.....
Bandera	2,158	3,795
Bastrop	17,215	20,736
Baylor	715	2,595
Bee	2,298	3,720
Bell	20,518	33,277
Bexar	30,470	49,266
Blanco	3,583	4,649
Borden	35	222
Bosque	11,217	14,224
Bowie	10,965	20,267
Brazoria	9,774	11,506
Brazos	13,576	16,650
Brewster	.....	710
Briscoe	12	.....
Brown	8,414	11,421
Buchel	.....	298
Burleson	9,243	13,001
Burnet	6,855	10,747
Caldwell	11,757	15,769
Calhoun	1,739	815
Callahan	3,453	5,457
Cameron	14,959	14,424
Camp	5,931	6,624
Carson	.....	356
Cass	16,724	22,554
Castro	.....	9
Chambers	2,187	2,241
Cherokee	16,723	22,975
Childress	25	1,175
Clay	5,045	7,503
Cochran	.....	.....
Coke	.....	2,059
Coleman	3,603	6,112
Collin	25,983	36,736
Collingsworth	6	357
Colorado	16,673	19,512
Comal	5,546	6,398
Comanche	8,608	16,608
Concho	800	1,065
Cooke	20,391	24,696
Coryell	10,924	16,873
Cottle	24	240
Crane	.....	15
Crockett	127	194
Crosby	82	346
Dallam	.....	112
Dallas	33,488	67,042
Dawson	24	29
Deaf Smith	38	179
Delta	5,597	9,117
Denton	18,143	21,289
De Witt	10,082	14,307
Dickens	28	295
Dimmit	665	1,049
Donley	160	1,056
Duval	5,732	7,598
Eastland	4,855	10,373
Ector	.....	224
Edwards	266	1,970
Ellis	21,294	31,774
El Paso	3,845	15,678
Encinal	1,902	2,744
Erath	11,796	21,594
Falls	16,240	20,706
Fannin	25,501	38,709
Fayette	27,996	31,481
Fisher	136	2,996
Floyd	3	529
Foley	.....	25
Fort Bend	9,380	10,586
Franklin	5,280	6,481
Freestone	14,921	15,987
Frio	2,130	3,112
Gaines	8	68
Galveston	24,121	31,476
Garza	36	14
Gillespie	5,228	7,056
Glasscock	.....	208
Goliad	5,832	5,910
Gonzales	14,840	18,016
Gray	56	203
Grayson	38,108	53,211
Gregg	8,530	9,402
Grimes	18,603	21,312
Guadalupe	12,202	15,217
Hale	.....	721
Hall	36	703
Hamilton	6,365	9,313
Hansford	18	133
Hardeman	50	3,904
Hardin	1,870	3,956
Harris	27,985	37,249
Harrison	25,177	26,721
Hartley	100	252
Haskell	48	1,665
Hays	7,555	11,352
Hemphill	149	519
Henderson	9,735	12,285
Hidalgo	4,347	6,534
Hill	16,554	27,583
Hockley	.....	.....
Hood	6,125	7,614
Hopkins	15,461	20,572
Houston	16,702	19,360
Howard	50	1,210
Hunt	17,230	31,885
Hutchinson	50	58
Irion	.....	870
Jack	6,626	9,740
Jackson	2,723	3,281
Jasper	5,779	5,592
Jeff Davis	.....	1,394
Jefferson	3,489	5,857
Johnson	17,911	22,313
Jones	546	3,797
Karnes	3,270	3,637
Kaufman	15,448	21,598
Kendall	2,763	3,826
Kent	92	324
Kerr	2,168	4,462
Kimble	1,343	2,243
King	40	173
Kinney	4,487	3,781
Knox	77	1,134
Lamar	27,193	37,302
Lamb	.....	4
Lampasas	5,421	7,584
La Salle	789	2,139
Lavaca	13,641	21,887
Lee	8,937	11,952
Leon	12,817	13,841
Liberty	4,999	4,230
Limestone	16,246	21,678
Lipscomb	69	632
Live Oak	1,994	2,055
Llano	4,962	6,772
Loving	.....	3
Lubbock	25	33
Lynn	9	24
McCulloch	1,533	3,217
McLennan	26,934	39,204
McMullen	701	1,033
Madison	5,395	8,512
Marion	10,983	10,862
Martin	12	264
Mason	2,655	5,180
Matagorda	3,940	3,985
Maverick	2,967	3,698
Medina	4,492	5,730
Menard	1,239	1,215
Midland	.....	1,033
Milam	18,659	24,773
Mills	.....	5,493
Mitchell	117	2,059
Montague	11,257	18,863
Montgomery	10,154	11,765
Moore	.....	15
Morris	5,032	6,580
Motley	24	139
Nacogdoches	11,590	15,984
Navarro	21,702	26,373
Newton	4,359	4,650
Nolan	640	1,573
Nueces	7,673	8,093
Ochiltree	.....	198
Oldham	287	270
Orange	2,938	4,770
Palo Pinto	5,885	8,320
Panola	12,219	14,328
Parker	15,870	21,682
Parmer	.....	7
Pecos	1,807	1,326
Polk	7,189	10,332
Potter	28	849
Presidio	2,873	1,698
Rains	3,035	3,909
Randall	3	187
Red River	17,194	21,452
Reeves	.	1,247
Refugio	1,585	1,239
Roberts	32	326
Robertson	22,383	26,506
Rockwall	2,984	5,972
Runnels	980	3,193
Rusk	18,986	18,559
Sabine	4,161	4,969
San Augustine	5,084	6,688
San Jacinto	6,186	7,360
San Patricio	1,010	1,312
San Saba	5,324	6,641
Schleicher	.....	155
Scurry	102	1,415
Shakleford	2,037	2,012
Shelby	9,523	14,365
Sherman	.....	34
Smith	21,863	28,324
Somervell	2,649	3,419
Starr	8,304	10,749
Stephens	4,725	4,926
Stonewall	104	1,024
Sutton	.	658
Swisher	4	100
Tarrant	24,671	41,142
Taylor	1,736	6,957
Terry	.....	21
Throckmorton	711	902
Titus	5,959	8,190
Tom Greene	3,615	5,152
Travis	27,028	36,322
Trinity	4,915	7,648
Tyler	5,825	10,877
Upshur	10,266	12,695
Upton	.....	52
Uvalde	2,541	3,804
Val Verde	.....	2,874
Van Zandt	12,619	16,225
Victoria	6,289	8,737
Walker	12,874	12,874
Waller	9,024	10,888
Ward	.....	77
Washington	27,565	29,161
Webb	5,273	14,842
Wharton	4,549	7,584
Wheeler	512	778
Wichita	433	4,831

TEXAS — Continued.

Counties.	Population. 1880.	1890.
Wilbarger	126	7,092
Williamson	15,155	25,909
Wilson	7,118	10,655
Winkler	.....	18
Wise	16,601	24,134
Wood	11,212	13,932
Yoakum	.....	4
Young	4,726	5,049
Zapata	3,636	3,562
Zavalla	410	1,097
Total	1,591,749	2,235,523

White, 1,745,935; Colored, 488,174; Indians, 704; Chinese, 710.

UTAH.

Beaver	3,918	3,340
Box Elder	6,761	7,642
Cache	12,562	15,509
Davis	5,279	6,751
Emery	556	5,076
Garfield	.....	2,457
Grand	.....	541
Iron	4,013	2,683
Juab	3,474	5,582
Kane	3,085	1,685
Millard	3,727	4,033
Morgan	1,783	1,780
Piute	1,651	2,842
Rich	1,263	1,527
Salt Lake	31,977	58,457
San Juan	204	365
San Pete	11,557	13,146
Sevier	4,457	6,199
Summit	4,921	7,733
Tooele	4,197	3,700
Uinta	799	2,762
Utah	17,973	23,768
Wasatch	2,927	3,595
Washington	4,235	4,009
Weber	12,344	22,723
Total	143,963	207,905

VERMONT.

Addison	24,173	22,277
Bennington	21,950	20,448
Caledonia	23,607	23,436
Chittenden	32,792	35,389
Essex	7,931	9,511
Franklin	30,225	29,755
Grand Isle	4,124	3,843
Lamoille	12,684	12,831
Orange	23,525	19,575
Orleans	22,083	22,101
Rutland	41,829	45,397
Washington	25,404	29,606
Windham	26,763	26,547
Windsor	36,196	31,706
Total	332,286	332,422

VIRGINIA.

Accomac	24,408	27,277
Albemarle	32,618	32,379
Alexandria	17,546	18,597
Alleghany	5,586	9,283
Amelia	10,377	9,068
Amherst	18,709	17,551
Appomattox	10,080	9,589
Augusta	35,710	37,005
Bath	4,482	4,587
Bedford	31,205	31,213
Bland	5,004	5,129
Botetourt	14,809	14,354

VIRGINIA — Continued.

Counties.	Population. 1880.	1890.
Brunswick	16,707	17,245
Buchanan	5,694	5,867
Buckingham	15,540	14,383
Campbell	36,250	41,087
Caroline	17,243	16,681
Carroll	13,323	15,497
Charles City	5,512	5,066
Charlotte	16,653	15,077
Chesterfield	25,085	26,211
Clarke	7,682	8,071
Craig	3,794	3,835
Culpeper	13,408	13,233
Cumberland	10,540	9,482
Dickenson	.....	5,077
Dinwiddie	32,870	13,515
Elizabeth City	10,689	16,168
Essex	11,032	10,047
Fairfax	16,025	16,655
Fauquier	22,993	22,590
Floyd	13,255	14,405
Fluvanna	10,802	9,508
Franklin	25,084	24,985
Frederick	17,553	17,880
Giles	8,794	9,090
Gloucester	11,876	11,653
Goochland	10,292	9,958
Grayson	13,068	14,394
Greene	5,880	5,622
Greensville	8,407	8,230
Halifax	33,588	34,424
Hanover	18,588	17,402
Henrico	82,703	103,394
Henry	16,009	18,208
Highland	5,164	5,352
Isle of Wight	10,572	11,313
James City	5,422	5,643
King & Queen	10,502	9,669
King George	6,397	6,641
King William	8,751	9,605
Lancaster	6,160	7,191
Lee	15,116	18,216
Loudoun	23,634	23,274
Louisa	18,942	16,497
Lunenburgh	11,535	11,372
Madison	10,562	10,225
Matthews	7,501	7,584
Mecklenburg	24,610	25,359
Middlesex	6,252	7,458
Montgomery	16,693	17,742
Nansemond	15,903	19,692
Nelson	16,536	15,336
New Kent	5,515	5,511
Norfolk	58,657	77,038
Northampton	9,152	10,313
Northumberl'd	7,929	7,885
Nottoway	11,156	11,582
Orange	13,052	12,814
Page	9,965	13,092
Patrick	12,833	14,147
Petersburg City	.....	22,680
Pittsylvania	52,589	59,941
Powhattan	7,817	6,791
Prince Edward	14,668	14,694
Prince George	10,054	7,872
Princess Anne	9,394	9,510
Prince William	9,180	9,805
Pulaski	8,755	12,790
Rappahannock	9,291	8,678
Richmond	7,195	7,146
Roanoke	13,105	30,101
Rockbridge	20,003	23,062
Rockingham	29,567	31,299
Russell	13,906	16,126
Scott	17,233	21,694
Shenandoah	18,204	19,671
Smyth	12,160	13,360
Southampton	18,012	20,078
Spottsylvania	14,828	14,233
Stafford	7,211	7,362
Surrey	7,391	8,256
Sussex	10,062	11,100
Tazewell	12,861	19,899
Warren	7,399	8,280
Warwick	2,258	6,650
Washington	25,203	29,020

VIRGINIA — Continued.

Counties.	Population. 1880.	1890.
Westmoreland	8,846	8,399
Wise	7,772	9,345
Wythe	14,318	18,019
York	7,349	7,596
Total	1,512,565	1,655,980

White, 1,020,122; Colored, 635,454; Chinese, 55; Indians, 349.

WASHINGTON.

Adams	.....	2,098
Asotin	.....	1,580
Chehalis	921	9,249
Clallam	638	2,771
Clarke	5,490	11,709
Columbia	7,103	6,709
Cowlitz	2,062	5,917
Douglas	.....	3,161
Franklin	.....	696
Garfield	.....	3,897
Island	1,087	1,787
Jefferson	1,712	8,368
King	6,910	63,989
Kitsap	1,738	4,624
Kittitas	.....	8,777
Klickitat	4,055	5,167
Lewis	2,600	11,499
Lincoln	.....	9,312
Mason	639	2,826
Okanogan	.....	1,467
Pacific	1,645	4,358
Pierce	3,319	50,940
San Juan	948	2 072
Skagit	.....	8,747
Skamania	809	774
Snohomish	1,387	8,514
Spokane	4,262	37,487
Stevens	1,245	4,341
Thurston	3,270	9,675
Wahkiakum	1,598	2,526
Walla-Walla	8,716	12,224
Whatcom	3,137	18,591
Whitman	7,014	19,109
Yakima	2,811	4,429
Total	75,116	349,390

White, 340,513; Colored, 1,602; Indians, 3,655; Chinese, 3,260; Japanese, 360.

WEST VIRGINIA.

Barbour	11,870	12,702
Berkeley	17,380	18,702
Boone	5,824	6,885
Braxton	9,787	13,928
Brooke	6,013	6,660
Cabell	13,744	23,595
Calhoun	6,072	8,155
Clay	3,460	4,659
Doddridge	10,552	12,183
Fayette	11,560	20,542
Gilmer	7,108	9,746
Grant	5,542	6,802
Greenbrier	15,060	18,034
Hampshire	10,366	11,419
Hancock	4,882	6,414
Hardy	6,794	7,567
Harrison	20,181	21,919
Jackson	16,312	19,021
Jefferson	15,005	15,553
Kanawha	32,466	42,756
Lewis	13,269	15,895
Lincoln	8,739	11,246
Logan	7,329	11,101
Marion	17,198	20,721
Marshall	18,840	20,735
Mason	22,293	22,863

W. VIRGINIA — CONTINUED.

Counties.	Population. 1880.	1890.
McDowell	3,074	7,300
Mercer	7,467	16,002
Mineral	8,630	12,085
Monongalia	14,985	15,705
Monroe	11,501	12,429
Morgan	5,777	6,744
Nicholas	7,223	9,309
Ohio	37,457	41,557
Pendleton	8,022	8,711
Pleasants	6,256	7,539
Pocahontas	5,591	6,814
Preston	19,091	20,355
Putnam	11,375	14,342
Raleigh	7,367	9,597
Randolph	8,102	11,633
Ritchie	13,474	16,621
Roane	12,184	15,303
Summers	9,033	13,117
Taylor	11,455	12,147
Tucker	3,151	6,459
Tyler	11,073	11,962
Upshur	10,249	12,714
Wayne	14 739	18,652
Webster	3,207	4,783
Wetzel	13,896	16,841
Wirt	7,104	9,411
Wood	25,006	28,612
Wyoming	4,322	6,247
Total	618,457	762,794

White, 730,077; Colored, 32,717.

WISCONSIN.

Counties.	Population. 1880.	1890.
Adams	6,741	6,889
Ashland	1,559	20,063
Barron	7,024	15,416
Bayfield	564	7,390
Brown	34,078	39,164
Buffalo	15,528	15,997
Burnett	3,140	4,393
Calumet	16,632	16,639
Chippewa	15,491	25,143
Clark	10,715	17,708
Columbia	28,065	28,350
Crawford	15,644	15,987
Dane	53,233	59,578
Dodge	45,931	44,984
Door	11,645	15,682
Douglas	655	13,468
Dunn	16,817	22,664
Eau Claire	19,993	30,673
Florence	.....	2,604
Fond du Lac	46,859	44,088
Forest	.....	1,012
Grant	37,852	36,651
Green	21,729	22,732
Green Lake	14,483	15,163
Iowa	23,628	22,117
Jackson	13,285	15,797
Jefferson	32,156	33,530
Juneau	15,582	17,121
Kenosha	13,550	15,581
Kewaunee	15,807	16,153
La Crosse	27,073	38,801
La Fayette	21,279	20,265
Langlade	685	9,465
Lincoln	2,011	12 008
Manitowoc	37,505	37,831
Marathon	17,121	30,369
Marinette	8,929	20,304
Marquette	8,908	9,676
Milwaukee	138,537	236,101
Monroe	21,607	23,211
Oconto	9,848	15,009
Oneida	.....	5,010
Outagamie	28,716	38,690
Ozaukee	15,461	14,943
Pepin	6,226	6,832
Pierce	17,744	20,385
Polk	10,018	12,968
Portage	17,731	24,798
Price	785	5,258
Racine	30,922	36,268
Richland	18,174	19,121
Rock	38,823	43 220
Sauk	28,729	30,575
Sawyer	.....	1,977
Shawano	10,371	19,236
Sheboygan	34,206	42,489
St. Croix	18,956	23,139
Taylor	2 311	6,731
Trempealeau	17,189	18,920
Vernon	23,235	25,111
Walworth	26,249	27,860
Washburn	.....	2,926
Washington	23,442	22,751
Waukesha	28,957	33,270
Waupaca	20,955	26,794
Waushara	12,687	13,507
Winnebago	42,740	50,097
Wood	8,981	18,127
Total	1,315,497	1,686,880

WYOMING.

Counties.	Population. 1880.	1890.
Albany	4,626	8,865
Carbon	3,438	6.857
Converse	.....	2,738
Crook	239	2,338
Fremont	.....	2,463
Johnson	637	2,357
Laramie	6,409	16,777
Natrona	.....	1,094
Sheridan	.....	1,972
Sweetwater	2,561	4,941
Uinta	2,879	7,881
Weston	.....	2,422
Total	20,789	60,705

White, 59,275; Colored, 922; Indians, 43; Chinese, 465.

ALASKA.

Districts.		
Southeastern	.....	8,038
Kadiak	.....	6,112
Unalaska	.....	2,361
Nushagak	.....	2,726
Kuskokwim	.....	5,681
Yukon	.....	3,912
Arctic	.....	3,222
Total	.....	32,052

OKLAHOMA.*

Beaver	.....	2,674
Canadian	.....	7,158
Cleveland	.....	6,605
Greer †	.....	5,338
Kingfisher	.....	8,332
Logan	.....	12,770
Oklahoma	.....	11,742
Payne	.....	7,215
Total	.....	61,834

* As this territory has been organized since 1880, no figures according to the Tenth Census can be given.

† In dispute; claimed by Texas.

INDIAN TERRITORY.

Nations.	Total Pop. 1890.	Indians.	Whites.	Negroes.	Chinese.
The Five Tribes	178,097	50,055	109,393	18,636	13
Cherokee	56,309	22,015	29,166	5,127	1
Chickasaw	57,329	5,223	48,421	3,676	9
Choctaw	43,808	11,057	28,345	4,406	
Creek	17,912	9,999	3,289	4,621	3
Seminole	2,739	1,761	172	806	

POPULATION OF THE SOUTHERN STATES BY RACES, FOR 1890.

States.	Total population.	White.	Colored.	Chinese.	Japanese.	Indians.
Total	23,875,259	16,925,910	6,949,349	2,580	126	7,781
Alabama	1,513,017	833,718	679,299	48	3	759
Arkansas	1,128,179	818,752	309,427	92	...	218
Delaware	168,493	140,066	28,427	37	...	4
District of Columbia	230,392	154,695	75,697	91	9	25
Florida	391,422	224,949	166,473	108	14	171
Georgia	1,837,353	978,357	858,996	108	5	68
Kansas	1,427,096	1,376,553	50,543	93	4	736
Kentucky	1,858,635	1,590,462	268,173	28	3	71
Louisiana	1,118,587	558,395	560,192	333	39	627
Maryland	1,042,390	826,493	215,897	189	7	44
Mississippi	1,289,600	544,851	744,749	147	7	2,036
Missouri	2,679,184	2,528,458	150,726	409	6	127
North Carolina	1,617,947	1,055,382	562,565	32	1	1,514
South Carolina	1,151,149	462,008	689,141	34	...	173
Tennessee	1,767,518	1,336,637	430,881	51	6	146
Texas	2,235,523	1,745,935	489,588	710	3	704
Virginia	1,655,980	1,020,122	635,858	55	16	349
West Virginia	762,794	730,077	32,717	15	3	9

POPULATION OF THE UNITED STATES AT EACH CENSUS, 1790-1830.

[From the Official Census of the United States, 1880 to 1890.]

	States and Territories.	1790.		1800.		1810.		1820.		1830.	
	The United States	3,929,214		5,308,483		7,239,881		9,633,822		12,866,020	
	The States	3,929,214		5,294,390		7,215,858		9,600,783		12,820,868	
1	Alabama	..	.....	..	.....	..	.....	19	127,901	15	309,527
2	Arkansas	..	.....	..	.....	..	.....	25	14,255	27	30,388
3	California	..	.....	..	.....	..	.....	..	.....	..	.....
4	Colorado	..	.....	..	.....	..	.....	..	.....	..	.....
5	Connecticut	8	237,946	8	251,002	9	261,942	14	275,148	16	297,675
6	Delaware	16	59,096	17	64,273	19	72,674	22	72,749	24	76,748
7	Florida	..	.....	..	.....	..	.....	..	.....	25	34,730
8	Georgia	13	82,548	12	162,686	11	252,433	11	340,985	10	516,823
9	Illinois	..	.....	..	.....	23	12,282	24	55,162	20	157,445
10	Indiana	..	.....	20	5,641	21	24,520	18	147,178	13	343,031
11	Iowa	..	.....	..	.....	..	.....	..	.....	..	.....
12	Kansas	..	.....	..	.....	..	.....	..	.....	..	.....
13	Kentucky	14	73,677	9	220,955	7	406,511	6	564,135	6	687,917
14	Louisiana	..	.....	..	.....	18	76,556	17	152,923	19	215,739
15	Maine	11	96,540	14	151,719	14	228,705	12	298,269	12	399,455
16	Maryland	6	319,728	7	341,548	8	380,546	10	407,350	11	447,040
17	Massachusetts	4	378,787	5	422,845	5	472,040	7	523,159	8	610,498
18	Michigan	..	.....	..	.....	24	4,762	26	8,765	26	31,639
19	Minnesota	..	.....	..	.....	..	.....	..	.....	..	.....
20	Mississippi	..	.....	19	8,850	20	40,352	21	75,448	22	136,621
21	Missouri	..	.....	..	.....	22	20,845	23	66,557	21	140,455
22	Nebraska	..	.....	..	.....	..	.....	..	.....	..	.....
23	Nevada	..	.....	..	.....	..	.....	..	.....	..	.....
24	New Hampshire	10	141,885	11	183,858	16	214,460	15	244,022	18	269,328
25	New Jersey	9	184,139	10	211,149	12	245,562	13	277,426	14	320,823
26	New York	5	340,120	3	589,051	2	959,049	1	1,372,111	1	1,918,608
27	North Carolina	3	393,751	4	478,103	4	555,500	4	638,829	5	737,987
28	Ohio	..	.....	18	45,365	13	230,760	5	581,295	4	937,903
29	Oregon	..	.....	..	.....	..	.....	..	.....	..	.....
30	Pennsylvania	2	434,373	2	602,365	3	810,091	3	1,047,507	2	1,348,233
31	Rhode Island	15	68,825	16	69,122	17	76,931	20	83,015	23	97,199
32	South Carolina	7	249,073	6	345,591	6	415,115	8	502,741	9	581,185
33	Tennessee	17	35,691	15	105,602	10	261,727	9	422,771	7	681,904
34	Texas	..	.....	..	.....	..	.....	..	.....	..	.....
35	Vermont	12	85,425	13	154,465	15	217,895	16	235,966	17	280,652
36	Virginia	1	747,610	1	880,200	1	974,600	2	1,065,116	3	1,211,405
37	West Virginia	..	.....	..	.....	..	.....	..	.....	..	.....
38	Wisconsin	..	.....	..	.....	..	.....	..	.....	..	.....
	The States	3,929,214		5,924,390		7,215,858		9,600,783		12,820,868	
1	Arizona	..	.....	..	.....	..	.....	..	.....	..	.....
2	Dakota	..	.....	..	.....	..	.....	..	.....	..	.....
3	District of Columbia	..	.....	1	14,093	1	24,023	1	33,039	1	39,834
4	Idaho	..	.....	..	.....	..	.....	..	.....	..	.....
5	Montana	..	.....	..	.....	..	.....	..	.....	..	.....
6	New Mexico	..	.....	..	.....	..	.....	..	.....	..	.....
7	Utah	..	.....	..	.....	..	.....	..	.....	..	.....
8	Washington	..	.....	..	.....	..	.....	..	.....	..	.....
9	Wyoming	..	.....	..	.....	..	.....	..	.....	..	.....
	The Territories	.....		14,093		24,023		33,039		39,834	
	Total Population	3,929,214		5,308,483		7,239,881		9,633,822		12,866,020	
				Increase per cent. 1790–1800, 35.10.		Increase per cent. 1801–1810, 36.38.		Increase per cent. 1810–1820. 33.07.		Increase per cent. 1820–1830, 33.55.	

Note.—The narrow column under each census year shows the order of the States and Territories when arranged according to magnitude of population.

POPULATION OF THE UNITED STATES AT EACH CENSUS, 1840–1890.

[From the Official Census of the United States, 1880 to 1890.]

	States and Territories.	1840.		1850.		1860.		1870.		1880.		1890.		Per cent. increase '80 to '90
	The United States.	*a* 17,069,453		23,191,876		31,443,321		38,558,371		50,155,783		62,622,250		.....
	The States	17,019,641		23,067,262		31,234,452		38,238,353		49,674,191		61,698,757		.....
1	Alabama	12	590,756	12	771,623	13	964,201	16	996,992	17	1,262,505	17	1,513,017	19.84
2	Arkansas	25	97,574	26	209,897	25	435,450	26	484,471	25	802,525	24	1,128,179	40.56
3	California	..	.....	29	92,597	26	379,994	24	560,247	24	864,694	22	1,208,130	39.72
4	Colorado	..	.....	..	.....	38	34,277	41	39,864	35	194,327	31	412,198	112.12
5	Connecticut	20	309,978	21	370,792	24	460,147	25	537,454	28	622,700	29	746,258	19.84
6	Delaware	26	78,085	30	91,532	32	112,216	35	125,015	38	146,608	42	168,493	14.93
7	Florida	27	54,477	31	87,445	31	140,424	33	187,748	34	269,493	32	391,422	45.24
8	Georgia	9	691,392	9	906,185	11	1,057,286	12	1,184,109	13	1,542,180	12	1,837,353	19.14
9	Idaho	..	.....	..	.....	..	.....	..	*14,999	..	*32,610	45	84,385	158.77
10	Illinois	14	476,183	11	851,470	4	1,711,951	4	2,539,891	4	3,077,871	3	3,826,351	24.32
11	Indiana	10	685,866	7	988,416	6	1,350,428	6	1,680,637	6	1,978,301	8	2,192,404	10.82
12	Iowa	29	43,112	27	192,214	20	674,913	11	1,194,020	10	1,624,615	10	1,911,896	17 68
13	Kansas	..	.....	..	.....	33	107,206	29	364,399	20	996,096	19	1,427,096	43.27
14	Kentucky	6	779,828	8	982,405	9	1,155,684	8	1,321,011	8	1,648,690	11	1,858,635	12.73
15	Louisiana	19	352,411	18	517,762	17	708,002	21	726,915	22	939,946	25	1,118,587	19.01
16	Maine	13	501,793	16	583,169	22	628,279	23	626,915	27	648,936	30	661,086	1.87
17	Maryland	15	470,019	17	583,034	19	687,049	20	780,894	23	934,943	27	1,042,390	11.49
18	Massachusetts	8	737,699	6	994,514	7	1,231,066	7	1,457,351	7	1,783,085	6	2,238,943	25.57
19	Michigan	23	212,267	20	397,654	16	749,113	13	1,184,059	9	1,636,937	9	2,093,889	27.92
20	Minnesota	..	.....	36	6,077	30	172,023	28	439,706	26	780,773	20	1,301,826	66.74
21	Mississippi	17	375,651	15	606,526	14	791,305	18	827,922	18	1,131,597	21	1,289,600	13.96
22	Missouri	16	383,702	13	682,044	8	1,182,012	5	1,721,295	5	2,168,380	5	2,679,184	23.56
23	Montana	..	.....	..	.....	..	.....	..	*20,595	..	*39,159	44	132,159	237.49
24	Nebraska	..	.....	..	.....	39	28,841	36	122,993	30	452,402	26	1,058,910	134 06
25	Nevada	..	.....	..	.....	41	6,857	40	42,491	43	62,266	49	45,761	26.51
26	New Hampshire	22	284,574	22	317,976	27	326,073	31	318,300	31	346,991	33	376,530	8 51
27	New Jersey	18	373,306	19	489,555	21	672,035	17	906,096	19	1,131,116	18	1,444,933	27.74
28	New York	1	2,428,921	1	3,097,394	1	3,880,735	1	4,382,759	1	5,082,871	1	5,997,853	18.00
29	North Carolina	7	753,419	10	869,039	12	992,622	14	1,071,361	15	1,399,750	16	1,617,947	15.59
30	North Dakota	..	.....	..	.....	..	.....	..	.....	..	*36,909	41	182,719	395.05
31	Ohio	3	1,519,467	3	1,980,329	3	2,339,511	3	2,665,260	3	3,198,062	4	3,672,316	14.83
32	Oregon	..	.....	34	13,294	36	52,465	38	90,923	37	174,768	38	313,767	79.53
33	Pennsylvania	2	1,724,033	2	2,311,786	2	2,906,215	2	3,521,951	2	4,282,891	2	5,258,014	22.77
34	Rhode Island	24	108,830	28	147,545	29	174,620	32	217,353	33	276,531	35	345,506	24.94
35	South Carolina	11	594,398	14	668,507	18	703,708	22	705,606	21	995,577	23	1,151,149	15.63
36	South Dakota	..	.....	..	.....	..	.....	..	.....	..	*98,268	37	328 808	234.60
37	Tennessee	5	829,210	5	1,002,717	10	1,109,801	9	1,258,520	12	1,542,359	13	1,767,518	14.60
38	Texas	..	.....	25	212,592	23	604,215	19	818,579	11	1,591,749	7	2,235,523	40.44
39	Vermont	21	291,948	23	314,120	28	315,098	30	330,551	32	332,286	36	332,422	0.04
40	Virginia	4	1,239,797	4	1,421,661	5	1,596,318	10	1,225,163	14	1,512,565	15	1,655,980	9.48
41	Washington	..	.....	..	.....	..	*11,594	..	*23,955	..	*75,116	34	349,390	365.13
42	West Virginia	..	.....	..	.....	..	.....	27	442.014	29	618,457	28	762,794	23.34
43	Wisconsin	30	30,945	24	305,391	15	775,881	15	1,054,670	16	1,315,497	14	1,686,880	28.23
44	Wyoming	..	.....	..	.....	..	.....	..	*9,118	..	*20,789	47	60,705	192 01
	The States	17,019,641		23,067,262		31,234,452		38,238,353		49,674,191		61,698,757		.....
	Alaska	..	.....	..	.....	..	.....	..	.....	..	.....	..	32,052	.....
	Arizona	..	.....	..	.....	..	.....	..	9,658	..	40.440	48	59,620	47.43
	D't of Columbia	..	43,712	..	51,687	..	75,080	..	131,700	..	177,624	39	230,392	29.71
	Indian	..	.....	..	.....	..	.....	..	.....	..	.....	..	178,097	.....
	New Mexico	..	.....	..	61,547	..	93,516	..	91,874	..	119,565	43	153,593	28.46
	Oklahama	..	.....	..	.....	..	.....	..	.....	..	.....	46	61,834	.....
	Utah	..	.....	..	11,380	..	40,273	..	86,786	..	143,963	40	207,905	44.42
	The Territories	43,712		124,614		208,869		320,018		481,592		923,493		.....
	Total Pop.	17,069,453		23,191,876		31,443,321		38,558,371		50,155,783		62,622,250		.....
		Increase per cent. 1830–1840, 32.67.		Increase per cent. 1840–1850, 35.87.		Increase per cent. 1850–1860, 35.58.		Increase per cent. 1860–1870. 22.63.		Increase per cent. 1870–1880, 30.08.		Increase per cent 1880–1890, 24.86.		.....

* Population when a territory.

a Including 6100 persons at sea in U. S. Service.

POPULATION OF ALL AMERICAN CITIES AND TOWNS OF 8000 INHABITANTS OR MORE.

CITIES AND TOWNS.	POPULATION.	
	1890.	1880.
Adams, Mass.	9,213	5,591
Adrian, Mich.	8,756	7,849
Akron, Ohio	27,601	16,512
Alameda, Cal.	11,165	5,708
Albany, N. Y.	94,923	90,758
Alexandria, Va.	14,339	13 659
Alleghany, Pa.	105,287	78,682
Allentown, Pa.	25,228	18,063
Alpena, Mich.	11,283	6,153
Alton, Ill	10,294	8,975
Altoona, Pa.	30,337	19,710
Amesbury, Mass.	9,798	3,355
Amsterdam, N. Y.	17,336	9,466
Anderson, Ind.	10,741	4,126
Ann Arbor, Mich.	9,431	8,061
Anniston, Ala.	9,876	942
Appleton, Wis.	11,869	8,005
Arkansas City, Kans.	8,347	1,012
Asheville, N. C.	10,235	2,616
Ashland, Wis.	9,956	.....
Ashtabula, Ohio.	8,338	4,445
Atchison, Kans.	13,963	15,105
Athens, Ga.	8,639	6,099
Atlanta, Ga	65,533	37,409
Atlanta City, N. J.	13,055	5,477
Auburn, Me	11,250	9,555
Auburn, N. Y.	25,858	21,924
Augusta, Ga.	33,300	21,891
Augusta, Me.	10,527	8,665
Aurora, Ill.	19,688	11,873
Austin, Tex.	14,476	11,013
Baltimore, Md.	434,439	332,313
Bangor, Me.	19,103	16,856
Bath, Me	8,723	7,874
Baton Rouge, La.	10,478	7,197
Battle Creek, Mich.	13,197	7,063
Bay City, Mich.	27,839	20,693
Bayonne, N. J.	19,033	9,372
Beatrice, Neb.	13,836	2,447
Beaver Falls, Pa.	9,735	5,104
Bellaire, Ohio.	9,934	8,025
Belleville, Ill.	15,361	10,683
Beverly, Mass.	10,821	8,456
Biddeford, Me.	14,443	12,651
Binghamton, N. Y.	35,005	17,317
Birmingham, Ala.	26,178	3,086
Bloomington, Ill.	20,048	17,180
Boston, Mass.	448,477	362,839
Braddock, Pa.	8,561	3,310
Bradford, Pa.	10,514	9,197
Bridgeport, Conn.	48,866	27,643
Bridgeton, N. J.	11,424	8,722
Brockton, Mass	27,294	13,608
Brookline Mass.	12,103	8,057
Brooklyn, N. Y.	806,343	566.663
Brunswick, Ga.	8,459	2,891
Buffalo, N. Y.	255,664	155,134
Burlington, Iowa.	22,565	19,450
Burlington, N. J.	8,222	6,090
Burlington, Vt.	14,590	11,365
Butler, Pa.	8,734	3,163
Butte, Mont.	10,723	3,363
Cairo, Ill.	10,324	9,011
Cambridge, Mass.	70,028	52,669
Camden, N. J.	58,313	41.659
Canton, Ohio.	26,189	12,258
Carbondale, Pa.	10,833	7,714
Cedar Rapids, Iowa.	18,020	10,104
Charleston, S. C.	54,955	49,984
Charlotte, N. C.	11,557	7,094
Chattanooga, Tenn.	29,100	12,892
Chicago, Ill.	1,099,850	503,185
Chicopee, Mass.	14,050	11,286
Chillicothe, Ohio.	11,288	10,938
Chippewa Falls, Wis.	8,670	3,982
Chelsea, Mass	27,909	21,782
Chester, Pa.	20,226	14,997
Cheyenne, Wyo.	11,690	3,456
Cincinnati, Ohio.	296,908	255,139
Cleveland, Ohio.	261,353	160,146
Clinton, Iowa.	13,619	9,052
Clinton, Mass	10,424	8,029
Cohoes, N. Y.	22,509	19,416
Colorado Springs, Colo.	11,140	4,226
Columbia, Pa.	10,599	8,312
Columbia, S. C.	15,353	10,036
Columbus, Ga.	17,303	10,123
Columbus, Ohio.	88,150	51,647
Concord, N. H	17,004	13,843
Corning, N. Y.	8,550	4,802
Council Bluffs, Iowa	21,474	18,063
Covington, Ky.	37,371	29,720
Cranston, R. I	8,099	5,940
Cumberland, Md.	12,729	10,693
Cumberland, R. I.	8,090	6,445
Dallas, Tex.	38,067	10,358
Danbury, Conn.	16,552	11,666
Danville, Ill.	11,491	7,733
Danville, Va.	10,305	7,526
Davenport, Iowa	26,872	21,831
Dayton, Ohio.	61,220	38,678
Decatur, Ill	16,841	9,547
Delaware, Ohio.	8,224	6,894
Denison, Tex.	10,958	3,975
Denver, Colo.	106,713	35,629
Des Moines, Iowa.	50,093	22,408
Detroit, Mich	205,876	116,340
Dover, N. H.	12,790	11,687
Dubuque, Iowa.	30,311	22,254
Duluth, Minn.	33,115	3,483
Dunkirk, N. Y.	9,416	7,248
Dunmore, Pa.	8,315	5,151
East Liverpool, Ohio.	10,956	5,568
Easton, Pa	14,481	11,924
East Portland, Ore	10,532	2,934
East Providence, R. I.	8,422	5,056
East Saint Louis, Ill.	15,169	9,185
Eau Claire, Wis.	17,415	10,119
Elgin, Ill.	17,823	8,787
Elizabeth City, N. J.	37,764	28,229
Elkhart, Ind.	11,360	6,953
Elmira, N. Y.	29,708	20,541
El Paso, Tex.	10,338	736
Erie, Pa.	40,634	27,737
Evansville, Ind.	50,756	29,280
Everett, Mass.	11,068	4,159
Fall River, Mass	74,398	48,961
Findlay, Ohio	18,553	4,633
Fitchburg, Mass.	22,037	12,429
Flint, Mich.	9,803	8,409

POPULATION OF ALL AMERICAN CITIES AND TOWNS, ETC.—*Continued.*

CITIES AND TOWNS.	POPULATION.		CITIES AND TOWNS.	POPULATION.	
	1890.	1880.		1890.	1880.
Flushing, N. Y.	10,868	6,683	La Salle, Ill.	9,855	7,847
Fond du Lac, Wis.	12,024	13,094	Lawrence, Kans.	9,997	8,510
Fort Scott, Kan.	11,946	5,372	Lawrence, Mass.	44,654	39,151
Fort Smith, Ark.	11,311	3,099			
Fort Wayne, Ind.	35,393	26,880	Leadville, Colo.	11,212	14,820
			Leavenworth, Kans.	19,768	16,546
Fort Worth, Tex.	23,076	6,663	Lebanon, Pa.	14,664	8,778
Framingham, Mass.	9,239	6,235	Lewiston, Me.	21,701	19,083
Frederick, Md.	8,193	8,659	Lexington, Ky.	21,567	16,656
Freeport, Ill.	10,189	8,516			
Fresno, Cal.	10,818	1,112	Lima, Ohio.	15,987	7,567
			Lincoln, Neb.	55,154	13,003
Galesburg, Ill.	15,264	11,437	Lincoln, R. I.	20,355	13,765
Galveston, Tex.	29,084	22,248	Little Falls, N. Y.	8,783	6,910
Gardner, Mass.	8,424	4,988	Little Rock, Ark.	25,874	13,138
Gloucester, Mass.	24,651	19,329			
Gloversville, N. Y.	13,864	7,133	Lockport, N. Y.	16,038	13,522
			Logansport, Ind.	13,228	11,198
Grand Rapids, Mich.	60,278	32,016	Long Island City, N. Y.	30,506	17,129
Green Bay, Wis.	9,069	7,464	Los Angeles, Cal.	50,395	11,183
Greenville, S. C.	8,607	6,160	Louisville, Ky.	161,129	123,758
Greenwich, Conn.	10,131	7,892			
Hagerstown, Md.	10,118	6,627	Lowell, Mass.	77,696	59,475
			Lynchburg, Va.	19,709	15,959
Hamilton, Ohio.	17,565	12,122	Lynn, Mass.	55,727	38,274
Hannibal, Mo.	12,857	11,074	McKeesport, Pa.	20,741	8,212
Harrisburg, Pa.	39,385	30,762	Macon, Ga.	22,746	12,749
Harrison, N. J.	8,338	6,898			
Hartford, Conn.	53,230	42,015	Madison, Ind.	8,937	8,945
			Madison, Wis.	13,426	10,324
Hastings, Neb.	13,584	2,817	Mahanoy, Pa.	11,286	7,181
Haverhill, Mass.	27,412	18,472	Malden, Mass.	23,031	12,017
Hazelton, Pa.	11,872	6,935	Manchester, Conn.	8,222	6,462
Helena, Mont.	13,834	3,624			
Henderson, Ky.	8,835	5,365	Manchester, N. H.	44,126	32,630
			Manchester, Va.	9,246	5,729
Hoboken, N. J.	43,648	30,999	Manistee, Mich.	12,812	6,930
Holyoke, Mass.	35,637	21,915	Mankato, Minn.	8,838	5,550
Hornellsville, N. Y.	10,996	8,195	Mansfield, Ohio.	13,473	9,859
Hot Springs, Ark.	8,086	3,554			
Houston, Tex.	27,557	16,513	Marblehead, Mass.	8,202	7,467
			Marietta, Ohio.	8,273	5,444
Hudson, N. Y.	9,970	8,670	Marinette, Wis.	11,523	2,750
Huntington, W. Va.	10,108	3,174	Marion, Ind.	8,769	3,182
Hutchinson, Kans.	8,682	1,540	Marion, Ohio.	8,327	3,899
Hyde Park, Mass.	10,193	7,088			
Indianapolis, Ind.	105,436	75,056	Marlborough, Mass.	13,805	10,127
			Marquette, Mich.	9,093	4,690
Ironton, Ohio.	10,939	8,857	Marshalltown, Iowa.	8,914	6,240
Iron Mountain, Mich.	8,599	.....	Massillon, Ohio.	10,092	6,836
Ishpeming, Mich.	11,197	6,039	Meadville, Pa.	9,520	8,860
Ithaca, N. Y.	11,079	9,105			
Jackson, Mich.	20,798	16,105	Medford, Mass.	11,079	7,573
			Melrose, Mass.	8,519	4,560
Jackson, Tenn.	10,039	5,377	Memphis, Tenn.	64,495	33,592
Jacksonville, Fla.	17,201	7,650	Menominee, Mich.	10,630	3,288
Jacksonville, Ill.	10,740	10,927	Meriden, Conn.	21,652	15,540
Jamestown, N. Y.	16,038	9,357			
Janesville, Wis.	10,836	9,018	Meridian, Miss.	10,624	4,008
			Michigan City, Ind.	10,776	7,366
Jeffersonville, Ind.	10,666	9,357	Middletown, Conn.	9,013	6,826
Jersey City, N. J.	163,003	120,722	Middletown, N. Y.	11,977	8,494
Johnston, R. I.	9,778	5,765	Milford, Mass.	8,780	9,310
Johnstown, Pa.	21,805	8,380			
Joliet, Ill.	23,264	11,657	Millville, N. J.	10,002	7,660
			Milwaukee, Wis.	204,468	115,587
Joplin, Mo.	9,943	7,038	Minneapolis, Minn.	164,738	46,887
Kalamazoo, Mich.	17,853	11,937	Moberly, Mo.	8,215	6,070
Kankakee, Ill.	9,025	5,651	Mobile, Ala.	31,076	29,132
Kansas City, Kans.	38,316	3,200			
Kansas City, Mo.	132,716	55,785	Moline, Ill.	12,000	7,800
			Montgomery, Ala.	21,883	16,713
Kearney, Neb.	8,074	1,782	Mount Carmel, Pa.	8,254	2,378
Keokuk, Iowa.	14,101	12,117	Mount Vernon, N. Y.	10,677	4,586
Key West, Fla.	18,080	9,890	Muncie, Ind.	11,345	5,219
Kingston, N. Y.	21,261	18,344			
Knoxville, Tenn.	22,535	9,693	Muscatine, Iowa.	11,454	8,295
			Muskegon, Mich.	22,702	11,262
Kokomo, Ind.	8,261	4,042	Nanticoke, Pa.	10,044	3,884
La Crosse, Wis.	25,090	14,505	Nashua, N. H.	19,311	13,397
Lafayette, Ind.	16,243	14,860	Nashville, Tenn.	76,168	43,350
Lancaster, Pa.	32,011	25,769			
Lansing, Mich.	13,102	8,319	Natchez, Miss.	10,101	7,058
			Natick, Mass.	9,118	8,479
Lansingburg, N. Y.	10,550	7,432	Nebraska City, Neb.	11,494	4,183
Laredo, Tex.	11,319	3,521	New Albany, Ind.	21,059	16,423
			Newark, N. J.	181,830	136,508

POPULATION OF ALL AMERICAN CITIES AND TOWNS, ETC.—*Continued.*

CITIES AND TOWNS.	POPULATION.	
	1890.	1880.
Newark, Ohio	14,270	9,600
New Bedford, Mass	40,733	26,845
New Brighton, N Y	16,423	12,679
New Britain, Conn	19,007	11,800
New Brunswick, N. J	18,603	17,166
Newburg, N. Y	23,087	18,049
Newburyport, Mass	13,947	13,538
Newcastle, Pa	11,600	8,418
New Haven, Conn	81,298	62,882
New London, Conn	13,757	10,537
New Orleans, La	242,039	216,090
Newport, Ky	24,918	20,433
Newport, R. I	19,457	15,693
New Rochelle, N. Y	8,318	5,276
Newton, Mass	24,379	16,995
New York, N. Y	1,515,301	1,206,299
Norfolk, Va	34,871	21,966
Norristown, Pa	19,791	13,063
North Adams, Mass	16,074	10,191
Northampton, Mass	14,990	12,172
Norwalk, Conn	17,747	13,956
Norwich, Conn	16,156	15,112
Oakland, Cal	48,682	34,555
Ogden, Utah	14,889	6,069
Ogdensburg, N. Y	11,662	10,341
Oil City, Pa	10,932	7,315
Omaha, Neb	140,452	30,518
Orange, N. J	18,844	13,207
Oshkosh, Wis	22,836	15,748
Oswego, N. Y	21,842	21,116
Ottawa City, Ill	9,985	7,834
Ottumwa, Iowa	14,001	9,004
Owensborough, Ky	9,837	6,231
Paducah, Ky	13,076	8,036
Paris, Texas	8,254	3,980
Parkersburg, W. Va	8,408	6,582
Passaic, N. J	13,028	6,532
Paterson, N. J	78,347	51,031
Pawtucket, R. I	27,633	19,030
Peabody, Mass	10,158	9,028
Peekskill, N. Y	9,676	6,893
Pensacola, Fla	11,750	6,845
Peoria, Ill	41,024	29,259
Perth Amboy, N. J	9,512	4,808
Petersburg, Va	22,680	21,656
Philadelphia, Pa	1,046,964	847,170
Phillipsburg, N. J	8,644	7,181
Phœnixville, Pa	8,514	6,682
Pine Bluff, Ark	9,952	3,203
Piqua, Ohio	9,090	6,031
Pittsburg, Pa	238,617	156,389
Pittsfield, Mass	17,281	13,364
Pittston, Pa	10,302	7,472
Plainfield, N. J	11,267	8,125
Plattsmouth, Neb	8,392	4,175
Plymouth, Pa	9,344	6,065
Port Huron, Mich	13,543	8,883
Port Jervis, N. Y	9,327	8,678
Portland, Me	36,425	33,810
Portland, Ore	46,385	17,577
Portsmouth, N. H	9,827	9,690
Portsmouth, Ohio	12,394	11,321
Portsmouth, Va	13,268	11,390
Pottstown, Pa	13,285	5,305
Pottsville, Pa	14,117	13,253
Poughkeepsie, N. Y	22,206	20,207
Providence, R. I	132,146	104,857
Pueblo, Colo	24,558	3,217
Quincy, Ill	31,494	27,268
Quincy, Mass	16,723	10,570
Racine, Wis	21,014	16,031
Raleigh, N. C	12,678	9,265
Reading, Pa	58,661	43,278
Richmond, Ind	16,608	12,742
Richmond, Va	81,388	63,600
Roanoke, Va	16,159	
Rochester, N. Y	133,896	89,366
Rockford, Ill	23,584	13,129
Rock Island, Ill	13,634	11,659
Rockland, Me	8,174	7,599
Rome, N. Y	14,991	12,194
Rutland, Vt	11,760	12,149
Sacramento, Cal	26,386	21,420
Saginaw, Mich	46,322	29,541
Saint Joseph, Mo	52,324	32,431
Saint Louis, Mo	451,770	350,518
Saint Paul, Minn	133,156	41,473
Salem, Mass	30,801	27,563
Salt Lake City, Utah	44,843	20,768
San Antonio, Tex	37,673	20,550
San Diego, Cal	16,159	2,637
Sandusky, Ohio	18,471	15,838
San Francisco, Cal	298,997	233,959
San José, Cal	18,060	12,567
Saratoga Springs, N. Y	11,975	8,421
Savannah, Ga	43,189	30,709
Schenectady, N. Y	19,902	13,655
Scranton, Pa	75,215	45,850
Seattle, Wash	42,837	3,533
Sedalia, Mo	14,068	9,561
Shamokin, Pa	14,403	8,184
Sheboygan, Wis	16,359	7,314
Shenandoah, Pa	15,944	10,147
Shreveport, La	11,979	8,009
Sing Sing, N. Y	9,352	6,578
Sioux City, Iowa	37,806	7,366
Sioux Falls, S. Dak	10,177	2,164
Somerville, Mass	40,152	24,933
South Bend, Ind	21,819	13,280
South Bethlehem, Pa	10,302	4,925
South Omaha, Neb	8,062	
Spencer, Mass	8,747	7,466
Spokane Falls, Wash	19,922	350
Springfield, Ill	24,963	19,743
Springfield, Mass	44,179	33,340
Springfield, Mo	21,850	6,522
Springfield, Ohio	31,895	20,730
Stamford, Conn	15,700	11,297
Steelton, Pa	9,250	2,447
Steubenville, Ohio	13,394	12,093
Stillwater, Minn	11,260	9,055
Stockton, Cal	14,424	10,282
Streator, Ill	11,414	5,157
Superior, Wis	11,983	
Syracuse, N. Y	88,143	51,792
Tacoma, Wash	36,006	1,098
Taunton, Mass	25,448	21,213
Terre Haute, Ind	30,217	26,042
Tiffin, Ohio	10,801	7,879
Titusville, Pa	8,073	9,046
Toledo, Ohio	81,434	50,137
Topeka, Kans	31,007	15,452
Trenton, N. J	57,458	29,910
Troy, N. Y	60,956	56,747
Union, N. J	10,643	5,849
Utica, N. Y	44,007	33,914
Vernon, Conn	8,808	6,911
Vicksburg, Miss	13,373	11,814
Vincennes, Ind	8,853	7,680
Waco, Tex	14,445	7,295
Waltham, Mass	18,707	11,712
Warwick, R. I	17,761	12,164
Washington, D. C	230,392	177,624
Waterbury, Conn	28,646	17,806
Watertown, N. Y	14,725	10,697
Watertown, Wis	8,755	7,883

POPULATION OF ALL AMERICAN CITIES AND TOWNS, ETC.—*Continued.*

CITIES AND TOWNS.	POPULATION.		CITIES AND TOWNS.	POPULATION.	
	1890.	1880.		1890.	1880.
Wausau, Wis	9,253	4,277	Wilmington, Del	61,431	42,478
West Bay City, Mich	12,981	6,397	Wilmington, N. C	20,056	17,350
West Chester, Pa	8,028	7,046	Winona, Minn	18,208	10,208
Westfield, Mass	9,805	7,587	Winston, N. C	8,018	2,854
West Troy, N. Y	12,967	8,820	Woburn, Mass	13,499	10,931
Weymouth, Mass	10,866	10,570	Woonsocket, R. I	20,830	16,050
Wheeling, W. Va	35,013	30,737	Worcester, Mass	84,655	58,291
Wichita, Kans	23,853	4,911			
Wilkesbarre, Pa	37,718	23,339	Yonkers, N. Y	32,033	18,892
			York, Pa	20,793	13,940
Williamsport, Pa	27,132	18,934	Youngstown, Ohio	33,220	15,435
Willimantic, Conn	8,648	6,608	Zanesville, Ohio	21,009	18,113

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